Fear, Crime, and Environmental Design

A Critique of Crime Prevention Through Environmental Design

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Fear, Crime, and Environmental Design:

A Critique of Crime Prevention Through Environmental Design

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Abstract

This thesis critiques the effectiveness of the theoretical foundations of Crime Prevention Through Environmental Design (CPTED). A narrative literature review reveals that, while CPTED can modestly reduce crime in residential settings, its broader impact is inconsistent and highly dependent on context and implementation. Evidence regarding its effect on fear of crime is limited, with studies indicating that social trust, perceived control, and collective efficacy play a stronger role than environmental design alone. The thesis critiques spatial determinism when applied in CPTED, arguing that it oversimplifies fear as an automatic reaction to physical cues. Drawing on neuroscience and psychology, it suggests framing fear as both a neurobiological process and a cognitively constructed one. This conceptualization reveals key limitations in CPTED. Interventions focused solely on physical cues may misdiagnose the underlying causes of fear. The thesis promotes urban design strategies that support safe exploration, social connection, and emotional resilience by enhancing the affordances of the built environment, that is, its capacity to invite and support adaptive, prosocial behavior. It calls for a more nuanced application of CPTED principles, informed by a psychological understanding of fear as a socially and cognitively mediated experience. This thesis finds that while CPTED may offer useful strategies for crime reduction, its conceptual reliance on spatial determinism and surface-level cues often misrepresents the psychological and social complexities of fear. When CPTED interventions succeed, it may not be because of the physical changes alone, but due to the social cohesion, trust, and ownership these interventions may foster. At the same time, public perceptions of safety may emphasize environmental symbols, order, or visibility, which do not always align with what reduces fear or risk. This tension reveals an important challenge: while participation may be essential for collective efficacy and long-term success, planners must also contend with the cognitive biases and learned fears that shape public judgment.

Keyword: Crime Prevention Through Environmental Design (CPTED) 1; fear of crime (FoC) 2; environmental determinism 3; spatial design 4; collective efficacy 5; perception of safety 6; urban greening 7; environmental psychology 8; symbolic cues 9; emotionally responsive design 10; neuroscience of fear 11; participatory planning 12.

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Abbreviations

BWT – Broken Windows Theory

CS+ – Conditioned Stimulus (positive; signals danger)

CS− – Conditioned Stimulus (negative; signals safety)

CPTED – Crime Prevention Through Environmental Design

EPE – Expectancy Prediction Error

FoC – Fear of Crime

HUD – Housing and Urban Development

ICA – International CPTED Association

RCT – Randomized Controlled Trial

SEM – Structural Equation Modeling

SLU – Swedish University of Agricultural Sciences

US – Unconditioned Stimulus

VTA – Ventral Tegmental Area

Introduction

Safety is increasingly recognized as a central concern in urban planning, shaping how people move, interact, and engage with space (Qin et al., 2024). However, perceptions of safety often diverge sharply from objective measures of risk, with fear frequently rooted in social trust, vulnerability, or uncertainty rather than actual threat (Jackson, 2009; Lorenc et al., 2014; O'Brien et al., 2019). In response to rising public and political concern, planners and policymakers are often under pressure to implement visible fixes, such as enhanced lighting, increased sightlines, and overt surveillance features, to signal action and safety (Armitage, 2013; Cozens & Love, 2015; Lorenc et al., 2014). These interventions may target the aesthetics of order more than the root causes of harm, producing only superficial or symbolic improvements (Lorenc et al., 2014; O'Brien et al., 2019; Taylor, 2002). This tension presents a core challenge for urban design: interventions based on perceived risk may not align with those that address objective harm. As this thesis explores in Part II, fear is not simply a reaction to environmental cues, but a socially and cognitively constructed experience as well, that in turn mediates how individuals interpret and engage with urban space (Jackson, 2009; O'Brien et al., 2019).

CPTED (pronounced "sep-ted") has emerged as a leading design framework for urban safety (Qin et al., 2024; Armitage, 2013; Cozens & Love, 2015). It proposes that appropriate design of the built environment can reduce both crime and fear of crime (Armitage, 2013; Cozens & Love, 2015; Crowe, 2000). CPTED's core principles, such as surveillance, territoriality, access control, and maintenance, have been institutionalized in many countries, including the USA, UK, and Australia, becoming embedded within local and national planning policies (ICA, 2023). However, CPTED's effectiveness remains contested. A growing body of research highlights its theoretical, methodological, and practical limitations (Armitage, 2018; Armitage & Monchuk, 2019; Lorenc et al., 2014; O'Brien et al., 2019). Some scholars have further questioned whether environmental design meaningfully influences fear at all, suggesting its effects may be overstated or misattributed (Jackson, 2009; Lorenc et al., 2014; O'Brien et al., 2019).

In turn, this thesis critically evaluates the theoretical foundations of CPTED and explores how its critiques intersect with its practical successes. It questions whether CPTED's inconsistent outcomes arise when a spatially deterministic understanding of human behavior takes precedence. While CPTED can often be applied as if fear can be mitigated primarily through physical design interventions, this thesis argues that fear is not just a reaction to environmental cues but a socially and cognitively constructed experience. One way this tension emerges in landscape architecture is through the frequent removal or simplification of complex greenery in urban settings due to perceived safety concerns. Such measures may unintentionally reduce ecological richness, biodiversity, sensory stimulation, and mental health benefits in favor of visibility and perceived order. These trade-offs are particularly relevant to the field of landscape architecture. This issue will be revisited later in the thesis as a key arena where emotionally responsive design and safety concerns intersect.

The thesis is structured in two parts:

Part I critically evaluates CPTED's core claims by tracing its historical development, examining its design principles, and assessing the empirical evidence supporting its effectiveness. It highlights key challenges in implementation, the mixed and context-dependent outcomes of environmental interventions, and the influence of social factors such as collective efficacy and community participation in shaping both perceived and actual safety.

Part II frames fear as partly a cognitively and socially constructed experience rather than a reflexive response to environmental stimuli alone. Drawing on neuroscience and psychology, it explores how fear is learned, interpreted, and potentially unlearned. It also examines how urban design might support resilience and trust. Rather than equating fear with automatic behavioral reactions, this thesis proposes a cognitive model in which fear emerges through appraisal, uncertainty, and social context, being partly distinct from direct physical responses to environmental cues.

By integrating insights from neuroscience with critiques of environmental determinism, this thesis contributes an interdisciplinary framework for understanding how built environments influence crime and the emotional experience of safety. In doing so, it seeks to inform urban design strategies that are both empirically grounded and psychologically responsive.

Aims

This thesis aims to contribute a critical and interdisciplinary perspective to ongoing debates on safety in landscape and urban design. As the influence of built environments on human perception and behavior gains increasing attention, the extent to which physical features shape emotional outcomes, such as fear, remains contested. By tracing this debate across multiple disciplines, this thesis can offer new insights into how environments affect people and how designers should respond.

This work is positioned at the intersection of environmental psychology, landscape architecture, criminology, and cognitive neuroscience. From this perspective, this thesis questions whether current approaches place too much emphasis on physical interventions in addressing fear, potentially overlooking its complex social and psychological dimensions.

This thesis argues that design professions should recognize fear as an inexorable part of how people experience space, not solely as an automatic or environmentally driven response, but also as a product of cognitive appraisal, social trust, and perceived control. This reframing challenges a foundational premise within traditional CPTED frameworks and raises questions about their continued relevance in contemporary CPTED practice. Finally, this thesis proposes a preliminary framework for emotionally responsive design that prioritizes resilience, not through avoidance or simplification, but by enabling safe engagement with uncertainty and emotional complexity.

This thesis distinguishes between three interrelated but analytically distinct concepts: (1) crime, referring to actual incidents of unlawful behavior; (2) fear of crime (FoC), defined as the emotional response to perceived risk or vulnerability; and (3) perceptions of safety, which encompass broader judgments about order, trust, and control within a given environment. While CPTED assumes that environmental design can reduce both crime and FoC, this thesis argues that these outcomes emerge through different pathways, crime being more responsive to opportunity structures, while FoC is shaped more strongly by cognitive appraisals and social context.

This thesis focuses specifically on a form of environmental determinism known as spatial determinism: the belief that the spatial configuration of the built environment directly shapes behaviors such as crime or fear. In response, this thesis challenges the notion that behavior is spatially determined and instead frames fear as a socially and psychologically mediated experience.

Methods

This thesis employs a narrative literature review methodology to evaluate the effectiveness and conceptual foundations of Crime Prevention Through Environmental Design (CPTED). Further, it aims to explore how insights from neuroscience and psychology can reframe the understanding of fear in urban spaces. As outlined by Snyder (2019), narrative reviews are well suited to research that seeks to synthesize theory, identify conceptual tensions, and integrate knowledge across disciplines. Unlike systematic reviews, which emphasize exhaustiveness and replicability, narrative reviews prioritize conceptual relevance and interpretive depth (Snyder, 2019; Sukhera, 2022). While this flexibility allows for richer theoretical integration, it also introduces limitations, such as reduced reproducibility and the risk of selection bias (Snyder, 2019; Sukhera, 2022). To address these concerns, this review was guided by clear research questions, a transparent search strategy, and a thematic synthesis focused on methodological rigor and theoretical contribution.

Literature Selection Process

My initial selection of literature focused on CPTED interventions and their reported outcomes, especially with regard to crime reduction and fear of crime. I began by analyzing approximately ten individual design interventions published between 2015 and 2025. This allowed me to explore the applied use of core CPTED strategies, such as natural surveillance, sightlines, territoriality, and access control.

I then broadened the scope to include systematic reviews, meta-analyses, and a mix of qualitative and quantitative studies on CPTED more broadly. Foundational texts and critiques from fields such as criminology, social psychology, and environmental design were included to provide both historical context and theoretical depth.

To ensure a thorough review, I employed snowballing and citation tracking to identify key works that were frequently referenced in the literature. This helped to link recent research to its conceptual roots and capture influential contributions that may not have appeared through keyword searches alone.

Inclusion Criteria and Study Types

Studies were selected based on their relevance to the following three key research questions:

CPTED's empirical effectiveness in reducing crime and fear of crime

The conceptualization and measurement of fear within CPTED frameworks

The applicability of contemporary psychological and neuroscientific models of fear to urban design.

I prioritized both qualitative and quantitative studies, as CPTED research often blends these approaches. However, I excluded studies that primarily focused on measuring perceived fear using single surveys, as these were critiqued for their methodological limitations by scholars such as Lorenc et al. (2014) and O'Brien et al. (2019). I also excluded studies that relied on cross-sectional designs without follow-up data or lacked robust methodological frameworks such as control groups. These types of studies were considered less reliable, particularly when they conflated fear with crime outcomes.

Given that many CPTED studies are quasi-empirical, I paid particular attention to longitudinal and experimental studies due to their higher reliability in assessing cause and effect. However, only a limited number of studies met these criteria, and even those studies showed mixed results in terms of CPTED's effectiveness. I used the critiques of Maxwell and Cole (2007) and Sherman, L.W., and Eck, (2002) to assess studies that relied on single-source bias and structural equation modeling (SEM)in cross-sectional designs, which often conflated fear and crime outcomes.

Literature Search and Identification Process

A structured literature search was conducted via Google Scholar and PubMed between February and April 2025, targeting peer-reviewed articles published from 2000 to 2025. The search terms included combinations of: "Crime Prevention Through Environmental Design (CPTED)," "Design out crime," "Fear of crime (FoC)," "Perception of safety," "Natural surveillance," "Broken Windows Theory (BWT)," "Access control," "Territoriality and crime prevention," and "Eyes on the street." As I delved deeper into the literature, I expanded the search to include meta-analyses and systematic reviews that summarized empirical findings across different studies, which I then used as cross-references to inform my critiques.

In addition to studies on CPTED interventions, I also reviewed critiques of CPTED, particularly those questioning its effectiveness in reducing crime and fear. These critiques, which primarily came from criminology, health sciences, and social psychology (e.g., Lorenc et al. (2014), O'Brien et al. (2019)), were essential for understanding both the strengths and limitations of CPTED. They helped frame my review within a broader, interdisciplinary context. At the same time, I recognized that many studies focus on disorder and perceived fear, rather than objective crime reduction or fear management, which led me to explore psychological theories that provide a more nuanced understanding of how fear is experienced and interpreted.

Organizing and Synthesizing Literature

The literature was organized thematically, focusing on key areas such as CPTED interventions, crime reduction, fear of crime, and the role of social factors in shaping safety. I also grouped studies based on their methodological features, such as qualitative vs. quantitative and empirical vs. theoretical studies. This thematic organization helped to identify patterns and contradictions across studies.

The use of AI: Minor grammar and clarity edits were made using Grammarly. ChatGPT (OpenAI) was used to assist in reviewing the structure and formatting of the thesis. No AI tools were used for generating content, conducting analysis, or interpreting findings. All critical thinking, argumentation, and academic decisions were made by the author.

PART I: Empirical Evaluation of CPTED

Part I of this thesis examines the conceptual foundations and empirical evidence surrounding Crime Prevention Through Environmental Design (CPTED). It traces the evolution of CPTED from early architectural theories to its contemporary applications and institutionalization. Drawing on systematic reviews, offender interviews, and meta-analytical findings, I assess both the strengths and limitations of design-based crime prevention strategies. I also explore how broader social, institutional, and contextual factors shape the effectiveness of these interventions in practice.

1.0 What is CPTED? (Definition, Principles)

Crime Prevention Through Environmental Design (CPTED) is an interdisciplinary approach that integrates urban planning, architectural design, and environmental management to reduce both crime and the fear of crime (Cozens & Love, 2015; Crowe, 2000; Taylor, 2002).

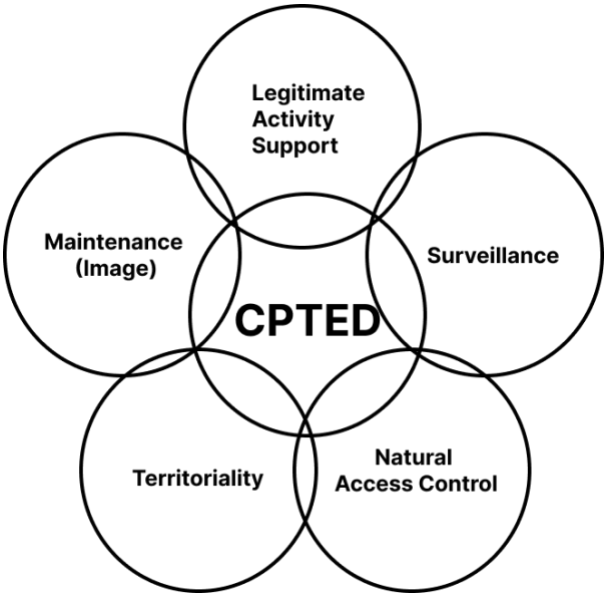

Figure 1. CPTED core principles.

CPTED foundational design principles seen in Figure 1 include: surveillance (design features that facilitate visibility and informal monitoring), territoriality (clearly distinguishing public and private spaces to foster ownership and guardianship), access control (managing entry points to increase the perceived risk for potential offenders), and maintenance (upholding physical conditions to deter signals of neglect and disorder) (Cozens & Love, 2015; Armitage & Monchuk, 2019; Crowe, 2000; Taylor, 2002). The central proposition underlying CPTED is that modifications to the physical environment can directly influence criminal behavior and perceptions of safety, aiming to reduce not only criminal incidents but also fear itself (Armitage & Monchuk, 2019; Cozens & Love, 2015; Crowe, 2000; Taylor, 2002).

In the CPTED framework, design refers to a wide spectrum of environmental features operating across multiple spatial scales, from individual architectural elements to the layout of entire neighborhoods (Armitage & Monchuk, 2019; Cozens & Love, 2015; Crowe, 2000; Taylor, 2002). These features include not only physical structures but also visual cues, spatial organization, and behavioral traces that influence how spaces are used, monitored, and interpreted (Armitage & Monchuk, 2019; Cozens & Love, 2015; Crowe, 2000; Taylor, 2002).

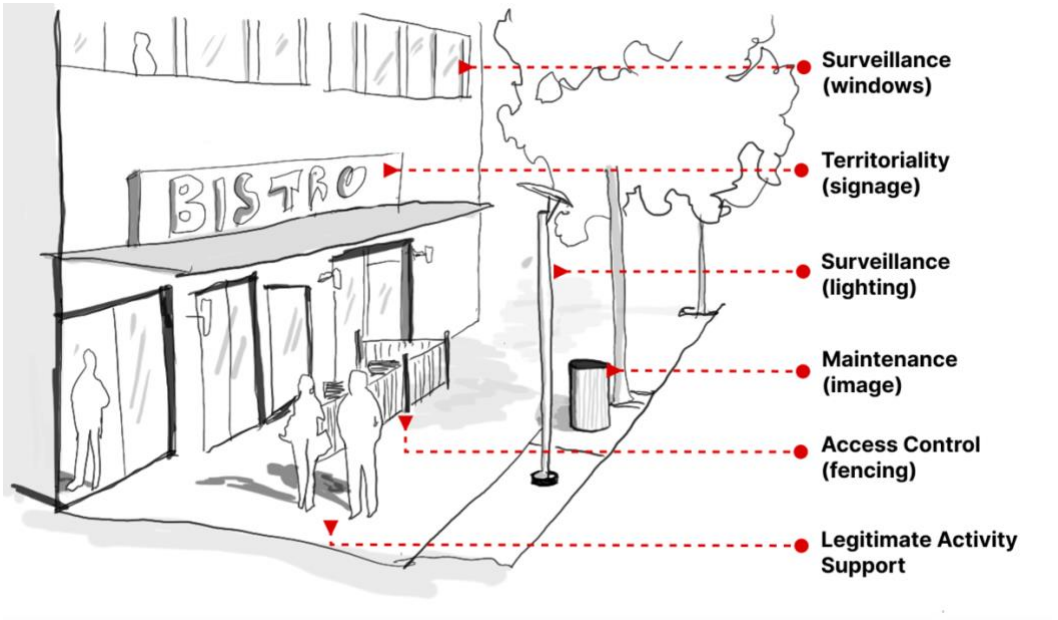

Figure 2. The author's illustration of the application of Crime Prevention Through Environmental Design (CPTED) principles in an urban commercial setting.

Diagnostic questions central to CPTED practice include:

Are building entrances visible from public spaces? How many windows overlook sidewalks, streets, or courtyards? Are streets and pathways well-lit to support nighttime surveillance? Do access routes minimize blind spots or hidden areas? Are entrances marked and easily monitored? Is there a clear distinction between public, semi-private, and private spaces? Are territorial markers such as fences, porches, or personalized landscaping present? Are properties well-maintained, and are they signaling care and stewardship? Is there a visible absence of disorder, vandalism, or neglect? Do residents appear to informally oversee and manage adjacent spaces? These questions attempt to embody the CPTED design logic, aiming to foster environments that discourage criminal opportunities while promoting perceptions of safety. A basic application of these strategies is illustrated in Figure 2, and their perceived affordances are described in Figure 3.

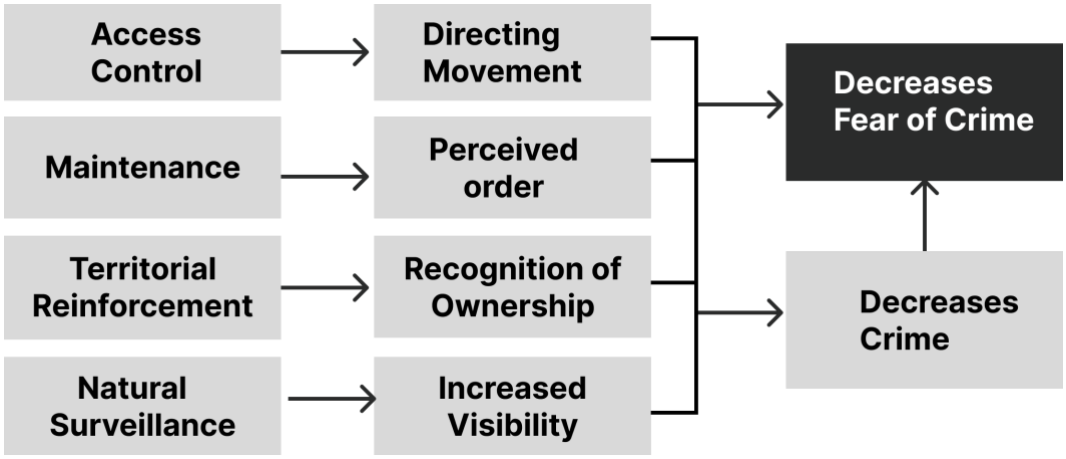

Figure 3. Author's Interpretation of Core CPTED Principles and Their Affordances in Environmental Design. This diagram integrates CPTED's core strategies with the concept of affordances (Gibson, 1979), highlighting how specific environmental features not only discourage crime but also shape users' perception and behavior by offering possibilities for action. For example, clear sightlines afford surveillance, while well-marked boundaries afford territorial recognition.

Having defined CPTED's core premises and design strategies, the following chapter will trace its historical evolution, examining how these principles were developed, adapted, and institutionalized within planning and policy contexts.

2.0 History of CPTED

It may seem intuitive that thoughtful environmental design could deter crime. Since the mid-twentieth century, some architects, urbanists, and criminologists have championed this idea. The concept was articulated as the idea that proper design and effective use of the built environment would lead to a reduction in the fear and incidence of crime (Crowe, 2000; Jeffery, 1971).

CPTED developed over several decades as a distinct framework, emerging from a multidisciplinary intersection of urban planning, criminology, architecture, and behavioral psychology (Cozens & Love, 2015). Although the belief that the built environment influences behavior may date back to early fortified settlements, the modern formulation of CPTED is recognized to have begun when U.S. federal initiatives funded research into crime prevention within public housing projects in the 1960s as a response to increasing crime rates (Taylor, 2002).

However, the idea that thoughtful urban design could prevent crime captured public attention through the work of Jane Jacobs (Armitage 2013; Cozens & Love 2015; Taylor 2002). In her influential book *The Death and Life of Great American Cities* (1961), Jacobs argued that vibrant, socially connected neighborhoods discourage fear and crime. She emphasized that continuous

pedestrian activity, mixed land uses, and clear distinctions between public and private space foster environments where residents naturally oversee their surroundings (Jacobs, 1961).

Jacobs introduced the concept of "eyes on the street," highlighting how everyday users, residents, shopkeepers, and pedestrians can provide informal surveillance. She proposed that active, visually connected streetscapes enhance both actual safety and perceptions of safety (Jacobs, 1961). Jacobs also stressed that low-rise, mixed-use neighborhoods encourage self-policing and strengthen civic responsibility (Jacobs, 1961). Her work challenged some modernist urban design principles, while asserting that spatial form could nurture social order rather than just reflecting it (Armitage, 2013; Jacobs, 1961; Gibson & Johnson, 2013).

At the same time, Elizabeth Wood, head of the Chicago Housing Authority in the early 1960s, advanced related ideas about community oversight (Gibson & Johnson, 2013). Although less widely recognized than Jacobs, Wood emphasized the role of resident engagement and territoriality in promoting neighborhood safety (Armitage, 2013; Gibson & Johnson, 2013). She advocated for communal recreational spaces and active resident stewardship as critical tools for crime prevention (Gibson & Johnson, 2013).

CPTED was formally introduced as a criminological concept by C. Ray Jeffery in his 1971 book Crime Prevention Through Environmental Design (Cozens & Love, 2015; Gibson & Johnson, 2013). Jeffery presented a biosocial model that integrated neurological and environmental factors to explain criminal behavior, arguing that punishment was an ineffective deterrent because crimes often go unpunished or are punished after significant delays, reducing opportunities for behavioral correction (Cozens & Love, 2015; Gibson & Johnson, 2013). Instead, he advocated for altering environments to make criminal behavior less likely (Cozens & Love, 2015; Jeffery & Zahm, 1993; Gibson & Johnson, 2013). As Jeffery and Zahm (1993) explained:

"The response of the individual organism to the physical environment is a product of the brain; the brain, in turn, is a product of genetics and the environment. The environment never influences behaviour directly, but only through the brain..." (p. 330).

Because of the sophistication of Jeffery's model, it may have been overshadowed by more practically oriented approaches (Cozens & Love, 2015).

Oscar Newman's 1972 book Defensible Space marked a turning point in operationalizing CPTED principles for urban policy and practice (Cozens & Love, 2015). Newman's theory focused on three key principles: territoriality, surveillance, and image (Newman, 1996). Collaborating with psychologist George Rand, Newman argued that large-scale housing projects lacked territoriality, which fostered resident disengagement (Newman, 1996; Cozens & Love, 2015). His emphasis on "natural surveillance" built upon Jacobs's earlier work, as illustrated in Figure 4, although he placed primary importance on establishing territoriality. Newman's third principle, image, proposed that environments signaling care and maintenance could deter crime by reinforcing social order (Newman, 1996; Cozens & Love, 2015).

Although Newman's work operationalized certain aspects of Jeffery's vision, it represented a significant narrowing of scope (Cozens & Love, 2015; Gibson & Johnson, 2013). Where Jeffery envisioned a biosocial model integrating neurological development, learning processes, and environmental influences, Newman translated crime prevention into largely architectural interventions (Cozens & Love, 2015; Gibson & Johnson, 2013). As a result, the emerging CPTED framework shifted from Jeffery's complex, interdisciplinary approach to a more spatially deterministic model focused primarily on the physical manipulation of the environment.

His framework greatly influenced U.S. housing policy, particularly through the Department of Housing and Urban Development's Defensible Space initiatives (Taylor, 2002), and later informed the HOPE VI housing reforms, which favored low-rise, mixed-income developments promoting resident stewardship (Taylor, 2002). Although Newman's model gained widespread adoption, scholars have raised concerns about the empirical weaknesses of his early studies (Taylor, 2002). Nevertheless, due to its clarity and policy relevance, Newman's work supplanted Jeffery's biosocial vision as the dominant basis for CPTED (Cozens & Love, 2015).

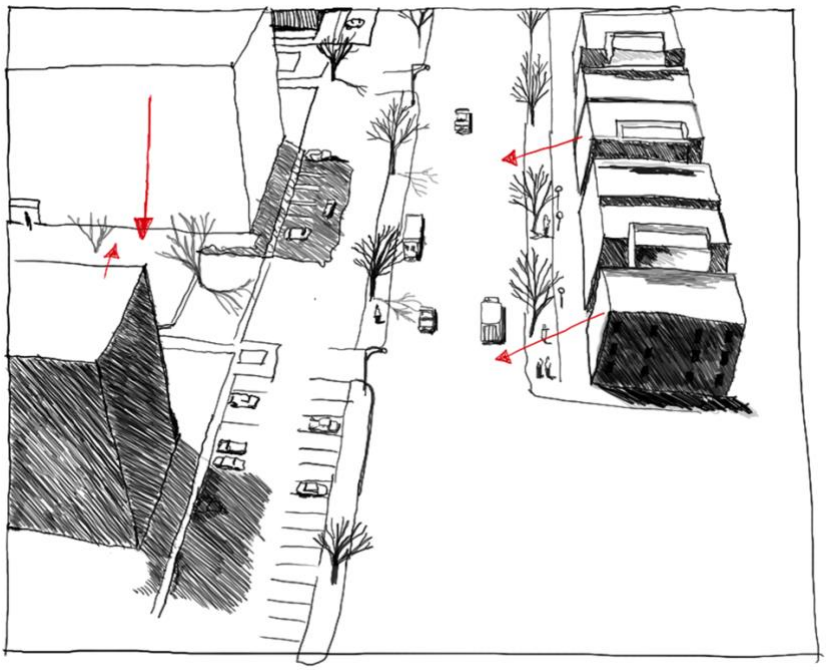

Fig. 4. Author's Illustration of Newman's interpretation of Jacobs' "eyes on the street" principle of surveillance. The housing project on the left is inward-facing and visually disconnected from the public realm, limiting opportunities for natural surveillance. In contrast, the development on the right integrates street-facing units with visible entryways and active frontages, encouraging informal monitoring and resident engagement with the street. Adapted from Newman (1996).

In 1982, Wilson and Kelling introduced Broken Windows Theory (BWT), which aligned with CPTED's image (maintenance), as it proposed that visible signs of disorder, such as graffiti, litter, and broken windows, signal neglect and invite further criminal behavior (Cozens and Love, 2015). According to BWT, maintaining order in public spaces discourages deviance by reinforcing informal social controls (Cozens and Love, 2015).

Broken Windows Theory strengthened CPTED's emphasis on physical maintenance as a crime prevention strategy (Cozens & Love, 2015). Advocates argued that addressing environmental cues like vandalism and poor lighting could significantly influence public perceptions of safety (O'Brien et al., 2019). However, critics have challenged BWT, noting that it often conflates perceptions of fear with actual crime risk (O'Brien et al., 2019). Despite these critiques, BWT's ideas about the signaling power of environmental cues have been widely incorporated into CPTED practices internationally (Cozens & Love, 2015).

The institutionalization of CPTED gained momentum with the UK's Crime and Disorder Act (1998), which mandated the integration of crime prevention considerations into urban planning processes (Armitage, 2013). While no equivalent legislation exists in the United States, CPTED principles have been widely promoted through agencies such as the General Services Administration (Armitage, 2013). On a global scale, CPTED has been institutionalized through mechanisms like the International CPTED Association's certification programs, which have been adopted in North America, Europe, Asia, and Latin America (Armitage, 2013).

Second-Generation CPTED, conceptualized in the late 1990s, sought to address criticisms of the original model by introducing social cohesion and neighbourhood planning into crime prevention strategies (Cozens & Love, 2015). This expansion attempted to realign CPTED with Jeffery's original interdisciplinary vision, though significant gaps remained, particularly regarding psychological and health-related dimensions (Cozens & Love, 2015; Mihinjac & Saville, 2019). However, scholars such as Ekblom (2011) have cautioned that broadening CPTED's scope risks weakening its conceptual coherence. As social interventions are layered onto environmental design strategies, it becomes increasingly difficult to isolate the specific effects of spatial design from broader social processes (Lorenc et al., 2014; O'Brien et al., 2019; Mihinjac & Saville, 2019).

Further recent scholarship has called for even a Third-Generation CPTED (Mihinjac & Saville, 2019). Third-Generation CPTED continues to extend beyond physical crime prevention to integrate public health, sustainability, and liveability (liveability is broadly defined as the quality of life experienced by residents in their physical and social environments) as central elements of safe neighbourhoods (Mihinjac & Saville, 2019). While this expansion embraces valuable contemporary concerns, it further blends environmental and social factors, complicating efforts to empirically disentangle the independent influence of design interventions (Mihinjac & Saville, 2019). Further, the existence of such frameworks does not entail that the practice follows suit (Armitage & Monchuck, 2019; Cozens & Love, 2015)

Meanwhile, contemporary practitioners such as Atlas (2013) have advocated for the integration of high-tech security systems into CPTED strategies, proposing the development of a universal "security code" for urban design (Cozens & Love, 2015). These technological adaptations reflect broader "Smart City" trends that emphasize surveillance, data analytics, and predictive policing (Kitchin, 2013; Kitchin et al., 2018). However, scholars have warned that such innovations may exacerbate social inequalities through algorithmic bias and over-surveillance (Kitchin, 2013; Kitchin et al., 2018).

Despite its institutional success, CPTED continues to face unresolved theoretical and empirical challenges. These include a lack of systematic evaluation, insufficient engagement with sociological factors such as race, class, and gender, and the danger of reinforcing inequitable spatial practices (Armitage, 2017; Cozens & Love, 2015; Ekblom, 2011; Lorenc et al., 2014; O'Brien et al., 2019; Taylor, 2002).

Accordingly, this thesis asks: Does Crime Prevention Through Environmental Design work? The following chapters examine the empirical evidence, distinguish between crime reduction and fear reduction, and assess whether CPTED fulfills its promise of promoting safer urban environments.

3.0 Empirical Audit of CPTED

The degree to which CPTED reduces actual victimization, rather than just improving perceptions of safety or mitigating visible disorder, remains contested. This section critically examines both the empirical evidence and conceptual foundations of CPTED, with particular attention to how its design principles are operationalized, implemented, and evaluated. It also highlights the influence of social context, methodological limitations, and theoretical coherence in shaping not only outcomes but also how those outcomes are interpreted.

3.1 Conceptual Challenges

The effectiveness of CPTED interventions are closely tied to how the approach is conceptualized and operationalized (Cozen & Love, 2015). Theoretical coherence influences what is measured, how outcomes are interpreted, and how interventions are designed (Cozen & Love, 2015; Gibson & Johnson, 2013). Scholars have criticized CPTED for its inconsistent use of terminology and lack of definitional clarity, complicating evaluation and comparison across studies (Ekblom, 2009; Armitage, 2013; Johnson et al., 2014). Efforts have been made to refine CPTED's conceptual base by integrating insights from environmental criminology and psychology (Ekblom, 2011; Gibson & Johnson, 2013).

A weak theoretical foundation can result in overly deterministic assumptions about the role of design in shaping behavior (Cozens & Love, 2015). CPTED has been critiqued for its reliance on environmental determinism, the notion that spatial configurations directly influence crime (Cozen & Love, 2015). Critics such as Taylor (2002) instead advocate a probabilistic perspective, where design influences but does not determine behavior.

The implementation of CPTED directly impacts its effectiveness and the reliability of evaluation results (Cozens & Love, 2015). Cozens and Love (2015) argue that CPTED is often applied as a checklist of design features, rather than as a flexible, context-sensitive approach. This standardized application can lead to poorly matched interventions that fail to address local needs (Cozen & Love, 2015). Armitage and Monchuk (2019) emphasize that institutional cultures, particularly within policing and security sectors, tend to favor procedural adherence over adaptive strategies, reducing responsiveness to specific crime contexts.

CPTED interventions can also produce unintended consequences. Measures intended to enhance safety, such as fencing or security shutters, and image maintenance, may increase the likelihood of crime (Amritage, 2018). These findings echo broader critiques that warn against rigid and overly standardized CPTED practices (Lorenc et al., 2014). They highlight the importance of adaptive human behaviors and appraisal (Amritage, 2018)

CPTED's integration with broader urban policy goals adds further complexity. Decisions about crime risk and appropriate design are often shaped by political values and institutional agendas (Armitage, 2013; Ekblom, 2011). These dynamics influence both implementation and evaluation, sometimes resulting in spaces that may prioritize exclusion or security over inclusivity. Moreover, CPTED interventions can conflict with other priorities such as walkability, sustainability, and public health, requiring trade-offs in planning and design (Armitage, 2013; Armitage, 2018; Cozens and Love, 2015).

Variability in who delivers CPTED advice, whether law enforcement, planners, or private consultants, also affects how interventions are implemented and evaluated (Cozens & Love, 2015). Legal frameworks and planning policies differ widely across jurisdictions, making it difficult to generalize findings or develop universal best practices (Armitage, 2018; Cozens & Love, 2015).

To improve CPTED's credibility, scholars advocate for greater theoretical clarity and methodological rigour, and for moving beyond prescriptive design templates toward adaptive, evidence-based practices tailored to local contexts (Armitage, 2018; Ekblom, 2011; Gibson and Johnson, 2013). Some CPTED researchers have argued that CPTED should be seen as a dynamic process involving crime risk assessment, stakeholder engagement, and iterative evaluation (Cozens and Love, 2015). Further recognizing that future evaluations must explicitly account for implementation factors and integrate both environmental and social variables (Cozens and Love, 2015).

3.2 Crime outcomes

Empirical evidence on CPTED's crime prevention impact is mixed and highly context-dependent. Systematic reviews suggest greater effectiveness in residential and commercial settings, where environmental controls are more easily applied (Cozens and Love, 2015). A meta-analysis of CCTV interventions found a modest reduction in vehicle theft, with the strongest effects observed in car parks and residential areas (Piza et al., 2019).

In contrast, CPTED's performance in open public spaces is less consistent, likely due to complex social dynamics and variable implementation quality (Cozens and Love, 2015; Piza et al., 2019). Many studies are weakened by methodological shortcomings, such as limited sample sizes, lack of control groups, and failure to control for confounders like socioeconomic status or neighbourhood cohesion (O'Brien et al., 2019; Lorenc et al., 2014). Evaluations depend significantly on how outcomes are defined, measured, and analysed (Taylor, 2002).

Some early studies reported positive findings (Cozens and Love, 2015). One review found that more than half of 45 studies showed crime reduction, particularly those involving surveillance and physical barriers (Cozens and Love, 2015). Reported robbery reductions ranged from 30% to 84% in some interventions (Casteel and Peek-Asa, 2000). However, concerns have since been raised about these findings due to methodological inconsistencies and limited generalisability (College of Policing, 2017).

The Maryland Scientific Methods Scale indicates that nearly all CPTED studies conducted before 2002 were rated at the lowest level of methodological rigour, classified as unknowable due to insufficient design quality (Sherman and Eck, 2002). Only two studies met the threshold for suggestive inference, underscoring the need for more rigorous and replicable research designs (Sherman and Eck, 2002).

Offender-based studies highlight important tensions between CPTED propositions and how offenders make decisions. Armitage's (2017) interviews with prolific burglars found that while many offenders did avoid environments with strong natural surveillance or physical security features, symbolic cues, such as personalization, maintenance, or signage, were interpreted inconsistently. Some offenders saw well-maintained properties as signs of guardianship and risk, while others interpreted them as indicators of wealth and opportunity (Armitage, 2017).

Armitage (2017) emphasizes that offender interpretations are not uniform. More experienced or determined offenders may prioritize structural features like fence height, escape routes, and window placement, while opportunistic or impulsive actors may respond more readily to visual cues of care or disorder. This variability challenges CPTED's underlying premise that environmental cues are interpreted consistently across offender types and highlights the need for more context-sensitive design strategies.

These insights also illustrate how CPTED elements can function inconsistently across different contexts. The same design feature, such as a high fence or a "private" sign, may serve as a deterrent in one case and an attractor in another. Recognizing this complexity, Armitage (2017) calls for a reassessment of CPTED's fundamental principles and a more nuanced understanding of how design influences offender perception.

These findings importantly highlight variation in offender decision-making; they also raise broader questions about how environmental cues are interpreted more generally, including by non-offenders. If even those directly engaged in target selection interpret CPTED features

inconsistently, it becomes critical to question how fear, safety, and space are understood by the wider public.

3.3 Second-Generation CPTED and Social Integration

As prior discussed, second-generation CPTED emerged as a response to criticisms of first-generation models, aiming to incorporate social and psychological dimensions into crime prevention strategies (Cozens and Love, 2015). This approach places greater emphasis on social cohesion, community culture, and informal guardianship. According to Cozens and Love (2015), effective guardianship requires more than physical presence, it depends on residents actively monitoring their surroundings and being willing to intervene. They identify several key factors that shape this capacity, including a person's willingness to supervise, their ability to recognise potential offenders, and their readiness to take action (Cozens and Love, 2015).

Although empirical evidence remains limited, several studies support the core principles of second-generation CPTED (Cozens and Love, 2015). Research on collective efficacy, social capital, and community engagement suggests that social infrastructure might be influential in shaping crime patterns (Heinze et al., 2018; Kvit et al., 2022). By embedding social dynamics into CPTED frameworks, second-generation strategies offer a more holistic model (Cozens & Love, 2015). Nonetheless, longitudinal and multi-method studies are needed to assess how social and physical elements interact and to what extent social cohesion moderates CPTED's effectiveness.

3.4 Environmental and Social Interactions

Recent studies examining greening-based environmental interventions for urban safety have been central to the growing interest in CPTED strategies Heinze et al., 2018; Kvit et al., 2022). These programs are frequently promoted as cost-effective solutions to urban crime, with proponents citing promising reductions in both property and violent offenses (Heinze et al., 2018; Kvit et al., 2022). However, while the results are often impressive at face value, a closer examination reveals a number of unresolved methodological and theoretical concerns. In particular, regarding the causal role of greening itself, as opposed to underlying community factors such as collective efficacy.

For example, Garvin et al. (2013) conducted one of the few randomised controlled trials (RCTs) on greening within the CPTED literature, evaluating vacant lot interventions in Philadelphia. Although methodologically rigorous, the study examined only two treated and two untreated lots, severely limiting its statistical power. The intervention improved perceptions of safety but did not reduce crime, highlighting a disconnect between subjective perceptions and actual outcomes. The study also underscores the challenge of applying RCTs to urban design, where interventions are inherently complex, spatially diffuse, and shaped by social context (Garvin et al., 2013).

In contrast, Kvit et al. (2022) reported strong effects in their quasi-experimental assessment of Baltimore's Care-a-Lot programme. During the summer months when community greening was active, they observed a 29% reduction in total crime and a 36% drop in violent crime (Kvit et al., 2022). However, these results come with important caveats. Because participation in Care-a-Lot was voluntary and community-led, the study could not isolate whether the observed reductions were due to the greening itself or to the collective efficacy of participants. This self-selection bias arises because more self-efficacious communities might be more likely to apply for and effectively implement greening efforts. As O'Brien et al. (2019) warn, evaluations that conflate environmental interventions with social mechanisms risk overstating the impact of design alone.

Similar concerns appear in Heinze et al. (2018), whose study of Flint's Clean & Green programme reported a 40% reduction in violent crime on treated streets. Although the study controlled for several socioeconomic variables, it was cross-sectional, like Kvit et al. (2022), and did not fully disentangle collective efficacy or social cohesion as mediating factors. Its quasi-experimental design also limits the ability to rule out reverse causality. Neighbourhoods with stronger organisational capacity may have been both more likely to implement greening effectively and to experience crime reductions due to other unmeasured social processes. While the authors attribute the results to a combination of physical maintenance and community engagement, they do not clarify the relative influence of each, which complicates efforts to evaluate CPTED's core design strategies' effectiveness empirically.

Lanfear (2022) adds further complexity by arguing that collective efficacy may actively shape the built environment over time, making it more difficult to disentangle cause and effect. His study finds that neighbourhoods with higher pre-existing levels of collective efficacy tend to have fewer criminogenic features, such as abandoned buildings and underused commercial properties (Lanfear, 2022). These findings suggest that greening may not directly foster cohesion or reduce crime, but rather reflect the social capital already embedded in a community. If this is the case, interventions like Care-a-Lot or Clean & Green may function less as standalone CPTED strategies and more as expressions or amplifications of existing neighbourhood-level social strength.

In summary, these studies seldom differentiate between the impact of environmental change and the activation of informal social control, a core element of second-generation CPTED (Lorenc et al., 2014; O'Brien et al., 2019). Greening initiatives that involve resident participation may appear effective not due to design improvements, but because they mobilise collective action (Lanfear, 2022; O'Brien et al., 2019). However, if these factors are not disentangled, it becomes impossible to establish clear causal relationships. As Lanfear (2022) and O'Brien et al. (2019) argue, such ambiguity limits the extent to which these interventions can be generalised or successfully replicated in less cohesive or more socially fragmented neighbourhoods.

Taken together, these critics suggest that greening interventions, while promising, may suffer from overstated claims about their design-based efficacy. Without clearer distinctions between social and spatial mechanisms, there is a risk that such programmes are misunderstood as purely environmental fixes when they are, in fact, socially contingent strategies (Lanfear, 2022; O'Brien

et al., 2019). This calls for more rigorous mixed-method studies that explicitly account for collective efficacy, community mobilisation, and resident perception (O'Brien et al., 2019). Only then can greening be meaningfully assessed as a CPTED strategy, rather than simply an indicator of something else.

3.5 The Confounding Problem

In their meta-analysis of Broken Windows Theory (BWT), O'Brien et al. (2019) examine the effects of disorder on (a) residents' general propensity toward aggressive behaviour and (b) their perceptions and attitudes about their neighbourhoods, including fear of crime. Given that visible disorder is a foundational theory to CPTED, and in light of promising results from studies such as Kvit et al. (2022) and Heinze et al. (2018), O'Brien et al. (2019) cast serious doubt on the claim that disorder directly causes either crime or fear. As they note:

> "Studies that found such effects disproportionately utilised weaker research designs that omit key correlates or confound perceptions of disorder with other neighbourhood attitudes" (O'Brien et al., 2019, p. 54).

This inconsistency is largely attributed to methodological shortcomings. Studies reporting strong associations between disorder and outcomes such as aggression or fear often rely on cross-sectional designs and frequently fail to control for key confounding variables, such as socioeconomic status or collective efficacy (O'Brien et al., 2019). Even when advanced techniques like structural equation modelling (SEM) are used, they can misestimate mediation processes when applied to cross-sectional data, introducing bias into causal interpretations (Maxwell and Cole, 2007).

Further complicating interpretation, many studies rely on the same respondents to rate both neighbourhood disorder and other outcomes, such as fear. While this perceptual approach is valid, it becomes problematic when findings are generalised beyond that frame. In such cases, it becomes difficult to determine whether disorder causes fear, or whether both perceptions are shaped by underlying psychological traits such as pessimism, social distrust, or prior victimisation (O'Brien et al., 2019).

In contrast, studies that apply more rigorous methods, such as longitudinal designs, multilevel modelling, or systematic environmental audits, and evaluate objective physical characteristics rather than residents' perceptions tend to report weaker or statistically non-significant effects (O'Brien et al., 2019). This distinction challenges foundational claims within both Broken Windows Theory and CPTED's emphasis on image maintenance, suggesting that observed relationships between disorder and fear may depend more on methodological framing than on consistent environmental effects.

O'Brien et al. (2019) further interrogate this relationship in a meta-analysis that found a very small overall effect size between disorder and aggression ($r = 0.007$), which disappeared entirely

when controlling for socioeconomic status. Notably, they found no significant differences in outcomes based on how disorder was measured (perceived vs. objective) or the type of disorder (social vs. physical). More robust studies, particularly those conducted outside the United States or using multilevel methods, consistently revealed diminished or negligible effects. While some subgroups, such as juveniles, showed slightly higher correlations (r = 0.02), these remained minor in magnitude (O'Brien et al., 2019).

O'Brien et al. (2019) also conducted tests for publication bias, revealing that several studies showing null or negative effects were likely missing from the literature. However, even accounting for this, the overall estimates remained low, reinforcing the view that disorder's perceived impact is likely inflated due to weaker study designs and omitted variable bias (O'Brien et al., 2019).

Expanding their critique, O'Brien et al. (2019) identify a broader problem of ecological validity in BWT research. Many experimental studies presume that witnessing minor rule violations (e.g., littering or graffiti) leads to more serious behaviors. However, this assumes individuals are already predisposed to such actions, an idea not fully supported by behavioral evidence (O'Brien et al., 2019). The leap from minor incivilities to serious crime is speculative and unsupported by robust data (O'Brien et al., 2019).

Another major concern involves the confounding of perceived disorder with broader neighborhood judgments (O'Brien et al., 2019). Because many studies rely on individuals' self-reports to assess both disorder and attitudes (e.g., fear or mistrust), these measures likely capture a general psychological orientation rather than a causal link (O'Brien, 2019). Moreover, perceptions of disorder are often shaped by unrelated factors, such as racial composition or economic context, meaning the relationship between objective and perceived disorder is weak at best (O'Brien et al., 2019; Sampson & Raudenbush, 2004).

A third key issue is the lack of appropriate control variables (O'Brien et al., 2019). In their meta-analysis, O'Brien et al. (2019) found that a significant proportion of studies failed to include basic controls such as socioeconomic status (excluded in 20% of aggression studies) or social process variables like collective efficacy (omitted in 56% of neighbourhood perception studies). These omissions systematically inflated the observed effect of disorder on behaviour and neighbourhood attitudes.

In light of these findings, O'Brien et al. (2019) proposed alternative theoretical models that retain disorder's relevance without relying on a deterministic premise. The social escalation model emphasises private, interpersonal conflict, such as domestic disputes or tenant–landlord issues, as more predictive of violence than public disorder. In this view, disorder signals a latent conflict dynamic rather than creating a permissive environment for crime; it is a symptom rather than a cause. Similarly, the ecological advantage model suggests that disorder may facilitate crime by providing cover (e.g., abandoned buildings), not by actively encouraging it. These frameworks advocate for targeted, socially informed interventions, such as conflict mediation or community-

based environmental remediation, rather than punitive responses to surface-level signs of disorder (O'Brien et al., 2019).

In sum, the findings of O'Brien et al. (2019) raise serious concerns about the empirical foundation of BWT and, by extension, aspects of CPTED that rely on the same symbolic logic. Rather than treating disorder as a direct cause of crime and fear, it may be more accurate to understand it as a symptom or facilitator of deeper structural and social issues, an understanding that calls for more nuanced, context-sensitive approaches to urban design.

3.6 What Can Designers Do?

Given the limitations of first-generation CPTED and the methodological concerns raised by O'Brien et al. (2019), a critical question emerges: how should designers respond? The answer lies not in abandoning environmental strategies altogether, but in rethinking their foundations. This means moving beyond prescriptive, surface-level fixes toward participatory, context-sensitive design processes that recognize the interplay between physical environments and social dynamics.

As demonstrated in studies such as Kvit et al. (2022) and Heinze et al. (2018), community greening initiatives, when led or maintained by residents, were associated with significant reductions in crime and violence. These outcomes were not solely due to greener or more orderly streets, but also to the processes of participation, stewardship, and collective efficacy they enabled. By contrast, Garvin et al. (2013)'s randomized greening trials, which lacked community involvement, improved perceptions of safety but had no measurable effect on crime.

These findings suggest a strategic pivot for designers. Rather than imposing isolated design solutions, the goal should be to create conditions that enable co-production, inviting residents to shape, maintain, and interpret their environments. Greening, in this context, is not simply symbolic or aesthetic; it provides spatial affordances for gathering, territorial expression, and informal social control. Its success may lie not in the physical intervention alone, but in the social meaning and interaction it supports.

At the same time, it is important to recognize that objective spatial features, such as visibility, access control, escape routes, and boundary legibility, can also influence crime risk. As noted earlier, offender-based studies (Armitage, 2017) highlight how some experienced offenders attend to such structural cues. Thus, environmental design can serve both practical and symbolic functions, but should be approached with nuance.

Drawing from O'Brien et al. (2019), it becomes clear that surface-level interventions alone may risk misattributing causality, appearing effective when they in fact reflect pre-existing social capital. Lanfear (2022) similarly suggests that the built environment often mirrors existing cohesion more than it creates it. Yet even if design does not directly generate social bonds, it

can amplify or sustain them. A design approach that is attuned to both physical affordances and social context is therefore needed for fostering safe spaces.

4.0 Evaluating CPTED's Effect on Fear of Crime

While CPTED asserts that modifying physical cues can reduce fear of crime (FoC), evidence suggests this relationship may be overstated due to how fear is conceptualised and measured. Much of the literature conflates subjective perceptions of disorder with fear itself, complicating evaluation (Jackson, 2009; Lorenc et al., 2014; O'Brien et al., 2019).

A critical insight from O'Brien et al. (2019) is that the effect of disorder on neighbourhood perceptions, including fear of crime, is negligible and highly contingent on how disorder is measured. When disorder is assessed using the perceptions of the same individual reporting fear, the correlation appears more substantial ($r = 0.14$ for social disorder and fear of crime). However, this relationship collapses when objective measures or aggregated resident reports are used (Lorenc et al., 2014; O'Brien et al., 2019). In fact, O'Brien et al. (2019) found that when disorder was measured independently of the focal individual, the direction of the effect either reversed or disappeared entirely. This suggests that prior findings supporting CPTED's FoC proposition may reflect perceptual confounds rather than causal processes. Such findings cast serious doubt on interventions like increased lighting or symbolic territorial cues when implemented on the belief that they reliably signal order and reduce fear.

Further, Lorenc et al. (2014) conducted a systematic review and meta-analysis of the effectiveness of CPTED strategies at reducing fear of crime. Their findings concluded that there is little evidence that the following reduce fear of crime: street lighting improvements, closed-circuit television, multicomponent environmental crime prevention programmes or regeneration programmes, and the evidence on housing improvement was mixed (Lorenc et al., 2014). While several factors in the physical environment are perceived to impact FoC, Lorenc et al., (2014) find that local social environment factors appear to be more important drivers. Subsequently, crime and FoC appear to be linked to health and well-being mainly as aspects of socioeconomic disadvantage (Lorenc et al., 2014).

Alongside this, Lorenc et al. (2014) note serious methodological limitations across studies evaluating CPTED interventions. Of the 47 studies they included, nearly half failed to report any statistical significance testing, and only 10 included time-based comparisons with control groups, some of which they report used questionable analytical methods. The widespread methodological shortcomings largely stemmed from two factors: the prevalence of uncontrolled or poorly matched study designs and incomplete methodological reporting, particularly in relation to sampling and recruitment procedures (Lorenc et al., 2014).

These limitations parallel concerns raised by O'Brien et al. (2019), who found that 64 per cent of studies examining neighbourhood disorder and fear of crime (FoC) relied solely on individual self-reports to measure disorder, without incorporating any independent or aggregate measures. This

introduces perceptual bias and undermines causal inference, as the same respondents were often both the source of disorder measurement and fear outcomes (O'Brien et al. 2019). O'Brien and colleagues also observed that studies reporting strong effects of fear of crime often employed weaker designs, omitting key covariates and conflating perceptions of disorder with other neighbourhood attitudes. As Lorenc et al. (2014) similarly emphasise, the failure to control for confounders and the lack of independent or rigorous methodological standards compromise the reliability of findings across much of the CPTED literature.

> "The findings thus do not support any strong conclusions on the effectiveness of interventions. To the extent that tentative conclusions can be drawn, the evidence suggests that most of the interventions considered are not effective in reducing fear of crime. When positive findings appear to emerge from single-group studies, they are rarely confirmed by more robust designs with matched comparison groups" (Lorenc et al. 2014, p. 53).

4.1 Rethinking CPTED's Effectiveness on Fear of Crime

So far, this thesis has explored how psychological constructs, such as perception, disorder, and safety, are applied in CPTED evaluations, and how these applications may be shaped by methodological choices or disciplinary assumptions. However, there might be a more fundamental concern about how key concepts like *fear* are defined and measured in the first place.

Much of the research claiming that CPTED reduces fear of crime may rest on flawed premise about what fear is. O'Brien et al. (2019) argue that many so-called fear measures do not capture emotional responses at all, but instead reflect residents' judgments about disorder or neighbourhood decline. Survey instruments often conflate perceived danger with dissatisfaction, meaning that people report feeling unsafe in areas they already view negatively, regardless of actual risk (Lorenc et al., 2014; O'Brien et al., 2019).

As a result, CPTED evaluations may overstate their effectiveness by interpreting changes in subjective attitudes as reductions in fear (O'Brien et al., 2019). Lorenc et al. (2014) similarly caution that many studies measure generalised unease or dissatisfaction with local conditions rather than clearly defined fear. They suggest that fear of crime often reflects broader social anxieties rather than an immediate or rational appraisal of a threat.

Both O'Brien et al. (2019) and Lorenc et al. (2014) argue that fear of crime is better understood as a context-dependent interpretation of environmental and social cues, shaped more by collective perception than by objective danger. This insight has serious implications for how CPTED interventions are designed and evaluated. If fear is socially and symbolically constructed, then design strategies must go beyond surface-level cues and engage more deeply with the interpretive and relational dynamics that shape people's sense of safety and place.

4.2 What is Fear of Crime

In the section preceding, I discussed the issue of measuring fear of crime in CPTED studies. This section further explores what fear of crime (FoC) is and how it can be understood and accounted for in environmental design.

While both crime and FoC can negatively impact public health, they operate through different pathways and are influenced by distinct environmental and social factors (Lorenc et al., 2014). This distinction suggests that FoC should not simply be treated as a proxy for crime levels, but rather as a reflection of how people evaluate the quality, safety, and social atmosphere of their environmentIn this sense, FoC may be more usefully understood not simply as a reaction to crime, but as an expression of broader concerns about social trust, environmental quality, and perceived community decline. Lorenc et al. (2014) argue that FoC often reflects underlying anxieties about exclusion or disorder, and that its health impacts, particularly on mental well-being and physical activity, arise more from these perceptions than from actual crime rates.

Qualitative research highlights that local social factors, like inequality and discrimination, often shape fear more than actual crime risk or physical surroundings (Lorenc et al. 2014; Jackson 2009). Fear tends to emerge when low crime risk feels personally relevant or emotionally charged due to broader social conditions (Lorenc et al. 2014).

As a result, interventions that address the social causes of fear are more effective at reducing it than those focused solely on crime prevention (Lorenc et al. 2014). However, it is still unclear if reducing fear alone leads to improved well-being (Lorenc et al. 2014). Lorenc et al. (2014) argue that fear and similar outcomes are shaped by complex, subjective social meanings, such as perceptions of neighbourhood decline, social exclusion, or distrust. These subjective perceptions do not conform neatly to linear cause-and-effect frameworks (Lorenc et al. 2014).

If fear is predominantly shaped by individual-level psychological processes, then changing visual cues in the environment may not address the root causes of fear for groups who already feel socially or physically vulnerable (Jackson, 2009).

Moreover, Lorenc et al. (2014) demonstrate that when controls for socioeconomic status and collective efficacy are omitted, as is common in many CPTED evaluations, the estimated effect of disorder on fear of crime is consistently inflated. This mirrors the issue raised by Jackson (2009), where feelings of fear stem not just from observable risks but from deeply rooted perceptions of personal susceptibility, which are mediated by social structures. In other words, people may feel afraid not because a street is dimly lit, but because they believe they wouldn't be helped if something happened, this being a perception shaped more by social cohesion and trust than design alone (Jackson, 2009).

Jackson (2009) describes individuals who believe they have more control over their environment or can protect themselves as being less likely to feel afraid, even if they perceive crime risk as

high. And further, that fear is not just personal, but relational; it is shaped by how individuals view the strength of their community, their trust in others, and their sense of social order (Jackson, 2009). When people perceive their neighbourhood as cohesive, they tend to feel safer, even when crime rates or perceived risks are high (Jackson, 2009). Indeed, when greening efforts are voluntarily maintained by residents, the positive outcomes may arise less from visual cues of order and more shared custodianship (O'Brien et al., 2019).

As Jackson (2009) explains, some of the strongest evidence around fear of crime points not to crime itself but to public concerns about neighbourhood disorder, cohesion, and collective efficacy. Jackson (2009) notes that crime and risk have become intertwined in the public imagination with broader anxieties about social stability, moral consensus, and the informal social controls that maintain neighbourhood order. In this view, everyday issues such as "young people hanging around," a perceived decline in community spirit, or low levels of trust act as symbolic indicators of disorder, fuelling feelings of unease, insecurity, and environmental distrust (Jackson 2009). Jackson argues that many people invoke the language of fear and crime not solely in response to victimisation but to express deeper concerns about neighbourhood decline, the erosion of civility, and the weakening of social capital.

In light of this, there may exist a need to recalibrate CPTED evaluations to distinguish between physical design for crime and for fear of crime. Alongside this, the effectiveness of design strategies could be measured in part by whether residents feel more capable, more connected, and more in control as a result of the process itself. Similarly, adding signage or fences may signal territoriality, but unless these cues are rooted in genuine community stewardship, they may not be interpreted as such.

In sum, as Jackson (2009) suggests, perceptions of safety are deeply rooted in social dynamics such as collective efficacy, trust, and cohesion, not just in the physical appearance of the environment. For urban planners, architects, and designers, this means that addressing fear of crime requires engaging with local perceptions of vulnerability and social breakdown, not only applying environmental fixes. Effective design would then incorporate community-level psychological and social factors as part of the planning process itself.

5.0 Summary of CPTED's Limitations

Over several decades, CPTED has evolved from a spatially focused design tool into a broader, socially infused strategy for urban safety. However, this expansion has revealed enduring theoretical, empirical, and methodological challenges that complicate its application and evaluation in contemporary cities. For urban designers and planners, understanding these shifts is essential, not just for choosing appropriate interventions, but for ensuring those interventions align with how people actually experience fear, not just how risk is perceived.

This thesis has examined the conceptual foundations, empirical evidence, and practical applications of Crime Prevention Through Environmental Design (CPTED). While CPTED proposes

that modifying built environments can reduce both crime and the fear of crime (FoC), its effectiveness has proven highly variable and context-dependent (Cozens & Love, 2015; Armitage, 2017).

Several critical reviews of CPTED have identified recurring limitations, although not all emphasize the same issues. Common themes include:

- Environmental determinism — the idea that spatial features alone can directly influence crime and fear (Taylor, 2002; Armitage, 2017; Cozens & Love, 2015).

- Methodological weaknesses — particularly the overextension of self-reported perception data beyond its interpretive scope, along with selection bias and insufficient control for confounding variables (College of Policing, 2017; Lorenc et al., 2014; O'Brien et al., 2019; Sherman & Eck, 2002).

- Limited attention to — or difficulty disentangling — social dynamics such as trust, collective efficacy, and informal guardianship, which may play a stronger role in shaping perceptions of safety than environmental design alone (Jackson, 2009; Heinze et al., 2018; Lanfear, 2022; O'Brien et al., 2019).

While some studies report modest reductions in crime, particularly in controlled residential contexts with well-defined design interventions (College of Policing, 2017; Lorenc et al., 2014), these findings are often constrained by methodological limitations, such as small sample sizes, lack of control groups, and reliance on short-term measures. In more complex and heterogeneous public spaces, where environmental conditions interact with diverse social dynamics, outcomes tend to be inconsistent and often inconclusive (Sherman & Eck, 2002; O'Brien et al., 2019). Notably, some evaluations misinterpret improvements in perceived safety, often based on self-reported data, as evidence of crime reduction or long-term fear mitigation. This risks overgeneralizing findings from narrow contexts to broader urban environments. Recent research suggests that without accompanying improvements in social cohesion and trust, physical interventions alone often do not produce durable reductions in fear of crime (Jackson, 2009; Lorenc et al., 2014; O'Brien et al., 2019).

Thus, the thesis finds that spatial interventions are insufficient when applied in isolation. A clearer distinction must be drawn between strategies that target crime rates and those aimed at addressing fear of crime. Growing empirical work shows that fear is less an automatic reaction to physical cues and more a product of social trust, perceived control, and contextual interpretation (Jackson, 2009; O'Brien et al., 2019).

Recognizing these limitations, Second-Generation CPTED emerged in the late 1990s, reintroducing concepts of collective efficacy, neighbourhood health, and social cohesion into crime prevention strategies (Cozens & Love, 2015). However, scholars such as Ekblom (2011) warn that expanding CPTED beyond its original environmental design focus risks diluting its

conceptual coherence. Furthermore, foundational theories such as Broken Windows and Newman's defensible space have come under sustained critique for overstating the causal link between physical disorder and crime or FoC outcomes (Taylor, 2002; Lorenc et al., 2014; O'Brien et al., 2019).

Persistent reliance on cross-sectional research designs has hindered the field's capacity to adequately capture the dynamic and reciprocal interactions between environmental and social factors (Maxwell & Cole, 2007; Lorenc et al., 2014; O'Brien et al., 2019). As Maxwell and Cole (2007) show in broader methodological research, even advanced techniques such as SEM introduce bias when applied to cross-sectional data, which has implications for CPTED evaluations. Without longitudinal studies, it remains difficult to disentangle whether observed improvements in safety are attributable to environmental changes or to concurrent shifts in social conditions (O'Brien et al., 2019).

This presents a particular challenge for design practitioners. If physical interventions are routinely implemented alongside social programs, yet evaluated together, the independent contribution of environmental design remains obscured (Mihinjac & Saville, 2019). Consequently, while Second and Third-Generation CPTED offer important expansions, they simultaneously complicate the development of evidence-based strategies grounded specifically in built form interventions.

Thus, while First-Generation CPTED could be recognized as a formative framework, contemporary safety design may benefit from moving toward context-sensitive, socially embedded approaches (Mihinjac & Saville, 2019). Importantly, although CPTED can influence certain crime patterns, its core premises on fear may warrant substantial reconsideration.

As explored in Part II of this thesis, fear of crime is better understood today as a socially and cognitively mediated phenomenon, rather than a direct response to environmental stimuli (Adolphs, 2013; LeDoux & Pine, 2014). Revisiting Jeffery's original interests, biosocial offers a broader view: one where safety is not reduced via avoidance, but learned, unlearned, and shaped through perception and experience.

Recognizing fear of crime as socially mediated aligns closely with emerging livability frameworks in urban planning, where safety is understood as interconnected with environmental quality, social participation, and psychological well-being (Mihinjac & Saville, 2019).

These findings suggest that strategies based solely on minimising visible disorder or ambiguity may fall short. In some cases, overly simplified environments may limit opportunities for emotional adaptation or trust-building. Part II explores how fear, resilience, and safety might instead be shaped through more dynamic, interpretive processes.

PART II: Recontextualizing Fear in Environmental Design

Building on the limitations identified in the preceding analysis, this chapter examines how fear is shaped by social, psychological, and environmental factors. Part I showed that while Crime Prevention Through Environmental Design (CPTED) has shaped urban planning for decades, its effectiveness in reducing both crime and fear of crime remains inconsistent and context-dependent (Jackson, 2009; Lorenc et al., 2014; O'Brien et al., 2019). Moreover, fear emerged not as a direct response to crime or environmental design, but as a complex, socially and psychologically mediated experience.

This raises a critical challenge: if fear is shaped more by perception, uncertainty, and trust than by objective danger, how should urban environments be designed? Responding just to crime statistics or fear surveys risks treating symptoms rather than causes. These tensions recall a fundamental question articulated by C. Ray Jeffery in his seminal work *Crime Prevention Through Environmental Design* (1971): how can crime prevention strategies effectively engage with the neurological and behavioral learning processes that shape individuals' responses to their environment?

This section reframes fear specifically through a cognitive and neurobiological lens. Drawing on contemporary research, it examines how fear is learned, sustained, and how it might be unlearned. Understanding these processes is essential if we are to design environments that meaningfully engage with fear.

6.0 Neuroscience of Fear

6.1 What Is Fear (LeDoux's Two-System Model)

What is fear? Therein lies a fundamental problem. To understand fear, it is necessary to begin with what is empirically known. However, what fear exactly is, is not exactly agreed upon. In neuroscience now, fear is no longer seen as a singular or uniform phenomenon (Adolphs, 2013; LeDoux & Pine, 2014; Pessoa, 2017). Instead, fear is increasingly understood as a multi-component process involving both automatic, non-conscious responses and cognitively constructed experiences (Adolphs, 2013; LeDoux & Pine, 2014; Pessoa, 2017).

LeDoux & Pine (2014) provide one of the most influential frameworks for parsing this complexity. According to their two-system model, fear comprises two distinct but interacting components:

1. Behavioral responses and accompanying physiological changes in the brain and body.

2. Conscious feeling states are reflected in self-reports of fear and anxiety, arising through higher-order cognitive functions including interpretation, language, and self-awareness.

LeDoux & Pine (2014) emphasize that the mechanisms that detect and respond to threats are not the same as those that give rise to the conscious experience of fear. This distinction forms the basis of his two-systems view of fear. LeDoux and colleagues argue that failure to recognize this division has impeded progress in treating fear-based disorders and has led to conceptual confusion in both research and clinical practice (LeDoux & Pine, 2014).

The Two-System Model

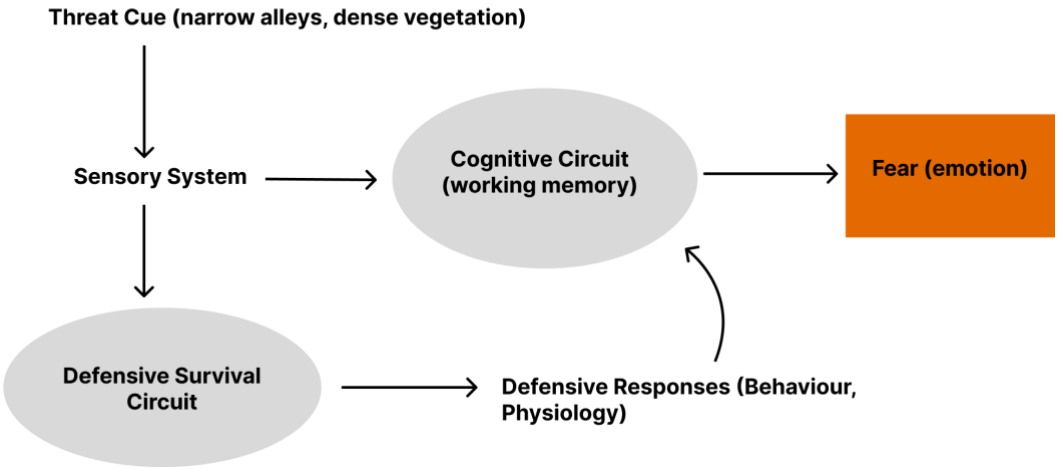

Figure 5. Two-System Model of Fear Processing.
Adapted from LeDoux & Pine (2014), this model distinguishes between unconscious defensive circuits and conscious fear experiences, emphasizing the role of cognitive appraisal in emotional responses.

To address long-standing conceptual confusion in the study of fear, LeDoux & Pine (2014) advocate for a terminological shift. He argues that the term fear should be reserved exclusively for the conscious experience of being afraid. Conscious experience is a state constructed by higher-order cognitive processes such as self-reflection, language, and meaning-making (LeDoux & Pine, 2014). In contrast, automatic physiological reactions to threat, like freezing or increased heart rate, should be labeled defensive responses governed by evolutionarily ancient survival circuits such as the amygdala (LeDoux & Pine, 2014). These two systems, while interacting, are distinct in their function, as illustrated in Figure 5.

However, while LeDoux's model offers critical conceptual clarity, it has also sparked debate. Critics argue that drawing a strict line between defensive behavior and conscious emotion may obscure how tightly intertwined these processes are in the brain and body. Adolphs (2013), for instance, proposes a more integrated view. He suggests that fear arises not from two separable systems but from the interaction of distributed networks that collectively process perception, appraisal, memory, and motor output. From this perspective, fear is not a unitary thing located in

one part of the brain. Instead, it is a context-sensitive state, shaped by goals, interpretation, experience, and social input.

Similarly, Pessoa (2017) argues against treating emotion and cognition as discrete domains. His research supports a networked, hierarchical model in which emotional processing is continuously modulated by attention, motivation, and meaning-making. Fear, in this account, is not triggered but rather constructed; it arises dynamically from organism–environment interactions. This approach blurs the boundary between unconscious and conscious processes, offering a middle ground between LeDoux's dualism and older reflex-based models.

Taken together, these perspectives suggest that fear is both embodied and interpretive. Defensive responses may be fast and automatic, but whether these translate into sustained emotional fear depends on cognitive and contextual factors. Fear cannot be fully understood or designed against by focusing only on environmental cues or reflexive reactions. Instead, effective design must engage with the layered, interpretive nature of fear, acknowledging that individuals cognitively construct emotional meaning.

6.2 Fear as cognitive-emotional interpretation, not reflex

This framework redefines fear not as a reflexive reaction to stimuli as in Pavlovian conditioning, but as a cognitive-emotional interpretation of bodily and environmental cues. As emphasized by Adolphs (2013), Garcia (2017), and LeDoux & Pine (2014), the conscious experience of fear is shaped by factors such as context, uncertainty, and prior knowledge. Emotional experience and physiological response (once assumed to be inseparable) are now understood as distinct, though interacting, components of the fear process (Adolphs, 2013; Garcia, 2017; LeDoux & Pine, 2014).

Importantly, this framework allows for fear to arise even in the absence of perceived immediate threat (LeDoux & Pine, 2014). One might, for example, consciously fear failure, uncertainty, or social exclusion, threats that are psychologically constructed rather than physically imminent (LeDoux & Pine, 2014). Therefore, these insights recognize the need to account for immediate risk and fear as separate phenomena. Here is seen a vitally important aspect of how fear can be misinterpreted in research, that is, whether or not a study conflates behavioral reflexes to stimuli with cognitive appraisal. Disentangling the two may be vitally important to describing causality.

Recent developmental research has also cautioned against assuming innate or universal fear responses to stimuli like darkness, heights, or certain spatial features. For example, LoBue and Adolph (2019) argue that infant responses to traditionally fear-relevant stimuli (e.g., snakes, spiders, strangers, and heights) are better characterized as perceptual biases rather than expressions of fear. These responses emerge contextually, vary widely among individuals, and lack consistent evidence of negative affect (LoBue and Adolph, 2019). This supports LeDoux's view of fear as an emergent, interpretive process, one that is shaped in part by developmental experience and meaning-making. While features such as curved paths, dim lighting, or partial concealment, described as mystery in landscape design, have been seen to elicit either aesthetic

intrigue or fear it is dependent on the outcomes of the explorative and meaning-making process(Kaplan & Kaplan, 1998; Herzog et al., 1998; LoBue & Adolph, 2019).

Crucially, these spatial features do not provoke fear inherently, but through interpretation (LoBue & Adolph, 2019). That interpretation depends on individual psychological traits (e.g., intolerance of uncertainty), prior experiences, and perceived control over the environment (Adolphs, 2013; Carleton, 2016; Garcia, 2017; Jackson, 2009; LeDoux & Pine, 2014; LoBue & Adolph, 2019). This is not to say these features cannot elicit a behavioral response, because when in fact they do, but to say the feature itself does not determine individual interpretation.

Thus, the emotional impact of environmental cues arises not from their objective properties alone, but from how they interact with the brain's survival systems and meaning-making mechanisms (Adolphs, 2013; Garcia, 2017; LeDoux & Pine, 2014). In ambiguous or uncertain settings, even neutral stimuli can become fear-evoking if they are appraised as signaling risk (Adolphs, 2013). And vice versa, arousal-inducing circumstances do not always invoke fear, as in the case of experiencing awe (Monroy and Keltner, 2023).

This suggests that environmental design strategies aimed at reducing fear, when not grounded in actual risk reduction, depend heavily on individual interpretation to determine their emotional impact. In this way, fear responses are shaped more by perception than by objective environmental conditions, much like how cultural associations, such as the gendering of colors like blue and pink, are socially constructed rather than inherent.

7.0 Fear Learning and Extinction

Understanding fear requires examining how it is acquired, regulated, and potentially unlearned. Drawing on LeDoux & Pine's (2014) dual-system model, this chapter explores two primary pathways of fear acquisition: associative learning and cognitive appraisal. It further addresses nonassociative fear responses, which may arise without direct traumatic experience. Together, these perspectives illuminate how both conscious and unconscious processes shape the development and persistence of fear. By integrating insights from neuroscience, developmental psychology, and clinical research, this chapter clarifies the mechanisms through which fear becomes entrenched and the processes by which it can be extinguished.

7.1 How Fear is Acquired

7.1.1 Defensive Threat Sensitivities and Nonassociative Responses

Do we innately fear snakes, spiders, heights, or darkness? It has been proposed that organisms display innate defensive responses to evolutionarily significant stimuli such as these (Garcia, 2017; LoBue & Adolph, 2019). These early reactions are sometimes labeled "nonassociative fear." However, developmental research complicates this interpretation.

LoBue and Adolph (2019) demonstrate that infants typically exhibit curiosity, attention, or context-sensitive wariness toward such stimuli, rather than genuine fear. As they find, most infants are not truly afraid of these stimuli; rather, they show curiosity and differentiate them from others. This exploratory behavior allows for flexible learning. It's not fear that helps them adapt, but attention, contextual evaluation, and the ability to learn whether something is truly dangerous (LoBue & Adolph, 2019).

In LeDoux & Pine's (2014) two-system framework, these nonassociative responses emerge from subcortical survival circuits that detect and prioritize threat-relevant stimuli, operating independently of the higher-order cognitive systems responsible for constructing the subjective experience of fear. Apparent instances of nonassociative fear are better characterized as early-stage attentional biases, as they do not necessarily elicit defensive responses or constitute conscious emotional fear (LoBue & Adolph, 2019).

These findings highlight that not all attention to potentially threatening features should be interpreted as evidence of fear. Rather, distinguishing between curiosity, attentional sensitivity, and genuine fear is essential for both theoretical clarity and for informing more nuanced approaches to environmental design.

7.1.2 Associative Fear (Experience-Based Learning)

While defensive sensitivities prioritize attention to potential threats, associative learning mechanisms allow organisms to predict and avoid danger based on direct experience. In classical (Pavlovian) fear conditioning, a neutral stimulus (CS+), such as a dark alley, becomes linked with an aversive unconditioned stimulus (US), like an attack (Raber et al., 2019). Over time, the CS+ alone can trigger conditioned defensive responses (CRs), including freezing, hypervigilance, and avoidance (Raber et al., 2019).

This form of learning is mediated by subcortical circuits, particularly the amygdala, which integrates sensory information about the CS and US to create a durable fear memory (Raber et al., 2019). Such associative learning is adaptive, enabling organisms to anticipate threats and respond preemptively (Raber et al., 2019). However, when survival circuits become hyper-responsive, associative fear responses can generalize to neutral or safe stimuli, contributing to the development of anxiety disorders such as PTSD (Garcia, 2017; Jo et al., 2018; Salinas-Hernández et al., 2018; Raber et al., 2019). In these cases, the brain's protective mechanisms, designed for survival, may overshoot, leading to maladaptive patterns of fear and avoidance (Garcia, 2017; Jo et al., 2018; Salinas-Hernández et al., 2018; Raber et al., 2019).

7.1.3 Cognitive Appraisal and the Fear of Uncertainty

Cognitive-appraisal models propose that fear is not simply a reaction to external threats, but a subjective emotional state that arises through interpretation and evaluation of internal and external information (LeDoux & Pine, 2014). According to these models, individuals assess bodily

signals, environmental cues, and social meanings to determine whether a situation poses a threat (LeDoux & Pine, 2014). Fear, within this framework, emerges when a situation is appraised as exceeding one's coping resources or as involving a significant loss of control (Carleton, 2016; Garcia, 2017; LoBue & Adolph, 2019). Thus, fear does not necessarily reflect the presence of an objective threat but often arises from the perception of unpredictability, uncontrollability, or uncertainty (Carleton, 2016; Garcia, 2017; LeDoux & Pine, 2014)

Ambiguity itself becomes threatening because it undermines the ability to predict and manage outcomes (Carleton, 2016). Evolution has biased organisms toward cautious threat detection and interpretation, leading to defensive responses and often fear, even when the objective probability of harm is low (LeDoux & Pine, 2014; Garcia, 2017). This bias explains why vivid but rare dangers are often feared more than common risks (Jackson, 2009; Slovic, 1987; Qin et al., 2024). Factors such as emotional salience, novelty, and perceived lack of control are stronger predictors of subjective fear than objective measures of danger (Garcia, 2017).

Importantly, Carleton (2016) argues that fear of the unknown operates as a core, irreducible driver of anxiety. Intolerance of uncertainty amplifies other fears and constitutes a broad vulnerability factor across many anxiety-related disorders (Carleton, 2016).

7.2 How Fear is Extinguished (Fear Extinction)

Fear extinction is not about erasing fear but about learning that previously threatening situations are now safe (Raber et al., 2019). Fear extinction involves new learning that inhibits the expression of the conditioned fear response, rather than erasing the original memory (Salinas-Hernández & Duvarci, 2021).

For example, a person who previously associated a dark alley (the conditioned stimulus, or CS+) with danger may, through repeated exposure without harm (the unconditioned stimulus, or US), form a new "safe" memory. This learning occurs through extinction prediction errors (EPEs), or mismatches between expected threat and experienced safety (Raber et al., 2019). These unexpected absences of harm trigger dopamine release, particularly in the medial ventral tegmental area (VTA), where dopamine neurons are activated in response to surprising safety (Jo et al., 2018; Salinas-Hernández et al., 2018).

This system helps us revise behavioral responses based on new evidence, supporting resilience and emotional regulation. Importantly, this is not a cognitve response**,** While the amygdala may influence the signals interpreted by higher cognitive systems, its role in conscious fear construction is indirect (LeDoux & Pine, 2014). However, it does affect the behavioral responses, such as fight or flight (LeDoux & Pine, 2014).

Importantly, during fear conditioning (the fear learning process), the brain learns to differentiate between a conditioned threat cue (CS+) and a safe cue (CS−). In a healthy individual, the brain's dopamine systems should respond strongly to the danger signal but ignore the safe one (Jo et al.,

2018). This helps us react adaptively, however, when fear becomes generalized, the brain starts reacting the same way to both the threatening and safe signals (Jo et al., 2018). The line between what's actually dangerous and what isn't becomes blurred, making it harder to feel safe, even in harmless situations (Jo et al., 2018). This impaired discrimination is a hallmark of anxiety disorders, where the brain struggles to distinguish genuine threats from benign stimuli (Jo et al., 2018; Salinas-Hernández & Duvarci, 2021).

These findings are important as they show that our ability to distinguish between safe and threatening environments depends heavily on how the brain processes and updates threatening experiences (Jo et al., 2018; Raber et al., 2019; Salinas-Hernández & Duvarci, 2021). When this process is disrupted, fear can become generalized, making it harder to feel safe even in low-risk settings (Jo et al., 2018; Raber et al., 2019; Salinas-Hernández & Duvarci, 2021). These findings suggest that the environment itself does not directly cause fear, but becomes associated with it through learned experiences. Fear emerges not from space itself, but from how individuals interpret and emotionally encode its association.

In sum, dopamine plays a critical role in both the brain's ability to discriminate between threat and safety and its capacity to update emotional predictions through extinction learning. These mechanisms are foundational for adaptive emotional regulation and offer important insights into the neurobiology of fear, resilience, and anxiety disorders.

Importantly, these findings demonstrate that uncertainty, when encountered without harm, serves as the vital condition for emotional recalibration. Rather than designing environments to eliminate all ambiguity, it may be more effective to create conditions that offer repeated opportunities for safe but unpredictable encounters. Such experiences may help individuals revise their internal threat models and support long-term emotional resilience.

These insights from neuroscience have shaped the foundation of modern therapies for fear-based disorders (David et al., 2018; Garcia, 2017; Graham & Milad, 2011). In the following section, I examine how these findings are applied clinically and what they reveal about the importance of repeated, meaningful interaction with space, both in therapy and potentially in urban design.

7.3 Therapy Implications

In earlier sections, this thesis outlined the basic neurobiological processes underlying fear, learning, and extinction. Building on these foundations, researchers have increasingly argued that fear extinction paradigms offer a powerful framework for identifying biomarkers of anxiety disorders (Graham & Milad, 2011). Anxiety, at its core, is characterized by a failure to appropriately inhibit or extinguish fear (Garcia, 2017; Graham & Milad, 2011). Understanding these mechanisms is crucial not only for clinical interventions but also for informing environmental design strategies. If fear extinction relies on safe prediction error learning, then

urban environments that support trust, exploration, and positive social experiences may play a pivotal role in reducing fear and fostering emotional resilience.

Phobias are typically classified as either experiential (developing after a specific traumatic event) or nonexperiential (arising without a clear cause), though the latter remains conceptually contested (Garcia, 2017; LoBue & Adolph, 2019). In both types, fear is sustained by hyperactivity in the brain's fear circuits, particularly in the amygdala, and reinforced by avoidance behaviors that prevent emotional relearning (Garcia, 2017).

Sensitization occurs when fear responses are amplified by repeated exposure to emotionally ambiguous stimuli, and poor habituation, being the failure to diminish fear responses to repeated safe exposures, exacerbates this dysregulation (Garcia, 2017). Experiential phobias are further maintained through avoidance behaviors that inhibit extinction learning, reinforcing the original fear associations (Garcia, 2017). In both types, heightened amygdala activation under uncertainty plays a critical role in the persistence of fear (Garcia, 2017).

Cognitive behavioural therapy (CBT), particularly in its exposure-based forms, is widely regarded as the most effective treatment for anxiety and fear-based disorders (David et al., 2018; Graham and Milad, 2011). David et al. (2018) argue that its greatest therapeutic effects stem from the behavioural and neurological mechanisms of extinction learning.

Numerous meta-analyses confirm that CBT significantly outperforms alternative interventions, producing robust and lasting reductions in anxiety symptoms (David et al., 2018). Its efficacy lies in facilitating gradual and systematic exposure to fear-related cues, such as specific places or situations, in a safe environment (David et al., 2018; Graham and Milad, 2011). This process allows individuals to confront conditioned stimuli (CS) without the anticipated aversive outcomes (unconditioned stimuli, US), thereby generating extinction prediction errors (EPEs)(Graham and Milad, 2011; Salinas-Hernández et al., 2018; Salinas-Hernández and Duvarci, 2019).

Exposure-based therapy thus directly targets the neural mechanisms underlying pathological fear, particularly the dysregulation in threat appraisal systems (Graham and Milad, 2011). Notably, individuals with anxiety often engage in safety behaviours, which offer short-term relief but hinder emotional relearning by preventing the violation of fearful expectations (Graham and Milad, 2011). CBT works by disrupting this cycle, reinforcing adaptive neural pathways through repeated disconfirmation of perceived danger (Graham and Milad, 2011).

Despite the success of exposure-based therapies, individual variability in extinction learning remains a challenge. Some individuals, particularly those with high trait anxiety or trauma histories, may experience sensitization. This refers to the amplification rather than the reduction of fear responses, driven by hyperactivity in amygdala circuits (Garcia, 2017; Avery & Blackford, 2016). In such cases, extinction learning is impaired, and anxiety symptoms may persist (Garcia, 2017; Jo et al., 2018; Salinas-Hernández et al., 2018).

Important to reiterate, fear is not a unitary construct; it involves both unconscious survival circuit activations and the conscious experience of apprehension (LeDoux, 2014). Anxiety, often oriented toward anticipated future threats, differs from immediate, present-moment fear responses (LeDoux & Pine, 2014). This distinction complicates treatment, as extinguishing defensive behaviours may not fully resolve subjective emotional distress.

While cognitive behavioural therapy (CBT) is often credited for its cognitive restructuring techniques, its effectiveness in treating fear-based disorders stems primarily from behavioural mechanisms rooted in extinction learning (David et al., 2018). However, as LeDoux (2014) notes, suppressing defensive reactions does not necessarily eliminate conscious fear. Thus, although exposure therapy remains the gold standard for anxiety treatment, it is not universally effective; its success depends on the brain's ability to generate prediction errors and update internal threat appraisals accordingly (David et al., 2018; LeDoux & Pine, 2014).

7.4 Fear as Cognitive Construction in the Built Environment

As discussed in prior sections, fear does not arise from spatial features in isolation, but from how individuals perceive, interpret, and appraise their environment based on prior experience, emotional states, and perceived control (LeDoux & Pine, 2014; Jackson, 2009). Elements like dense vegetation, enclosed paths, or low lighting have long been associated with unsafe feelings (Kaplan & Kaplan, 1989). However, these features do not possess intrinsic emotional valence; rather, their interpretation is shaped by cultural narratives, experience, and social signals (LoBue & Adolph, 2019; Kaplan & Kaplan, 1989; Lorenc et al., 2014).

This insight challenges the environmental determinism implicit in many CPTED strategies. As research shows, even spaces with identical physical features can evoke very different emotions depending on context, where fear in one setting can be awe or curiosity in another (Herzog & Miller, 1998; Monroy & Keltner, 2023). Fear, then, is best understood as an interpretive construction of environmental stimuli.

Importantly, built environments carry emotional affordances; as a particular entity can invite certain modes of interpretation as well as interactions (Gibson, 1979; Herzog & Miller, 1998). For example, winding paths might afford exploration or concealment, depending on the user's mental state and surrounding context (Kaplan & Kaplan, 1989; Herzog & Miller, 1998). Such affordances may be co-constructed between the environment and the perceiver, meaning that fear is not an inevitable outcome, but one possible emotional interpretation among many (Gibson, 1979; Adolphs, 2013; Barrett, 2017; LeDoux & Pine, 2014).

Consequently, environments that seek to reduce fear should not default to reducing complexity as a simple solution. Instead, the focus should shift toward enabling safe and meaningful engagement with uncertainty. This perspective aligns with the neurobiological mechanisms discussed earlier, particularly extinction learning through prediction error.

Drawing from this research, I propose that just as exposure therapy involves repeated, safe engagement with feared stimuli, public spaces can similarly function as arenas for the gradual reappraisal of perceived threat. Supportive and thoughtfully designed environments may offer opportunities for extinction learning by providing safe but ambiguous encounters, conditions under which prediction error and cognitive reappraisal are most effective (Graham & Milad, 2011; Raber et al., 2019).

Rather than viewing design as a tool to eliminate fear, we might instead view it as a medium for emotional recalibration, not suppressing defensive responses, but offering repeated, manageable invitations to re-engage with uncertainty, mystery, and novelty. From this perspective, fear becomes less an obstacle to be engineered out and more a signal to be reframed through the experiential, social, and interpretive qualities of place.

Building on prior arguments, spatial elements such as partial concealment, winding paths, or dense vegetation seen in Figure 6, do not inherently provoke fear; they are framed through prior experience, perceived control, and cultural narratives (LeDoux, 2014; LoBue & Adolph, 2019; Kaplan & Kaplan, 1989). Like color symbolism, for instance, blue coded as masculine, the perception of what is is partly shaped by a cultural bias. As such, relying solely on public perceptions of fear risks reinforcing any existing biases rather than addressing the mechanisms that produce them.

Fear should not be conceptualized as a direct consequence of spatial qualities alone, such as mystery, legibility, or visibility, but as an emotional response shaped by cognitive appraisal, fear learning, and habituation. Mystery, defined as partial concealment or environmental ambiguity, can evoke either fear or curiosity depending on context (Kaplan & Kaplan, 1989; Herzog & Miller, 1998). Herzog and Miller's "fear–mystery paradox" describes how moderate mystery can enhance engagement, while excessive mystery may heighten anxiety.

Figure 6. The author's illustration of the effects of vegetation density on sightlines. This effect is seen by some to determine perceived safety through visibility. Dense vegetation would then signal concealment and evoke fear, while open areas enhance the perception of control.

Yet mystery does not intrinsically provoke fear; rather, its emotional impact is highly dependent on context (Kaplan & Kaplan, 1989; Herzog & Miller, 1998). Recent research further suggests that the same environmental conditions often associated with fear can also evoke awe (Monroy & Keltner, 2023). Awe is a distinct positive emotion characterized by encounters with vastness, novelty, and ambiguity that resist easy comprehension (Monroy & Keltner, 2023). Under the right conditions, mystery can promote psychological restoration, prosocial behavior, and meaning-making, rather than avoidance (Monroy & Keltner, 2023). Awe differs sharply from fear and anxiety both physiologically and phenomenologically (Monroy & Keltner, 2023). It produces neurophysiological shifts toward parasympathetic regulation, reduces self-focus, enhances prosociality, strengthens social integration, and fosters resilience through meaning-making (Monroy & Keltner, 2023).

Figure 7. Author's illustration of perceived safety in "wild" versus "tame" nature, adapted from Kaplan, Kaplan, and Ryan (1998). Unfamiliar, densely vegetated settings (left) are often perceived as more threatening, while open, managed landscapes (right) are generally associated with greater perceived safety.

Crucially, awe emerges not from environmental clarity but from experiences of mystery and perceptual ambiguity, which may reframe the relationship illustrated in Figure 7 (Monroy & Keltner, 2023). This demonstrates that spatial ambiguity alone is not a threat to eliminate, but an emotional affordance capable of fostering exploration, emotional growth, and well-being, depending on cognitive framing and perceived situational control. In other words, the same environmental condition can result in either positive or negative emotion depending on the appraisal of risk.

8.0 Reframing Fear Design: Toward Interpretive Environments

Fear is not merely a reflexive reaction to environmental cues. Neuroscience increasingly understands it as the product of both automatic defensive systems and higher-order cognitive

appraisal (Adolphs, 2013; LeDoux & Pine, 2014; Pessoa, 2017). Emotional responses emerge from a combination of fear-learning mechanisms and cognitively assembled experiences (LeDoux & Pine, 2014). This reframing complicates any direct stimulus–response models of fear.

In response to these limitations, this thesis advocates for recognizing the varied emotional outcomes afforded by the built environment and proposes that the process of overcoming fear is an inherent part of how space is experienced. Rather than eliminating fear-associated cues, design can introduce manageable novelty and encourage exploration and thus reinterpretation. This approach aligns with exposure-based therapeutic models, in which gradual, controlled engagement with uncertainty fosters meaning-making and emotional regulation (David et al., 2018; Graham & Milad, 2011).

In light of these insights, this thesis presents a preliminary conceptual framework for emotionally responsive design, informed by the affective sciences. Rather than rejecting traditional safety interventions such as lighting or visibility, this framework encourages a more nuanced understanding of their psychological effects, particularly over time and across diverse user experiences. The model is not intended as a prescriptive formula but as a design heuristic: a guiding structure to help designers and planners engage more thoughtfully with the emotional dimensions of space.

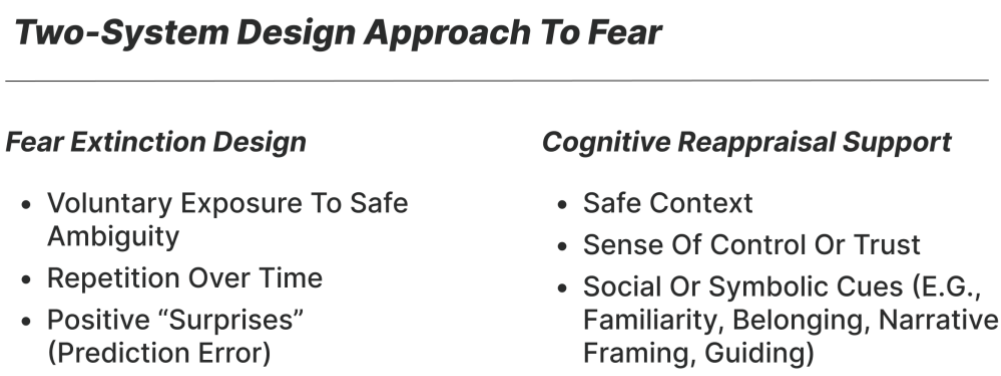

Figure 8. *Two-System Design Approach to Fear.* This model draws on LeDoux and Pine's dual-system model of fear to address both subcortical defensive systems (survival circuits) and higher-order cognitive appraisal mechanisms. It does not seek to eliminate all fear cues, but to facilitate both fear extinction and threat reappraisal through design.

The model presented in Figure 8 does not aim to eliminate all fear cues, but rather to support fear extinction and cognitive reappraisal. Strategies may include:

- Increased Complexity: Environments with enhanced spatial or visual depth, or greater habitat variation

- Ambiguous Features: Elements that invite exploration and support reinterpretation

- Temporal and Cultural Engagement: Recognition that user experiences shift across time, culture, and space

- Co-Interpretation: Emphasis on shared meaning-making and experience through narrative and engagement

These strategies are not theoretical. As discussed in Part I, green infrastructure projects that include community participation have been associated with both increased perceptions of safety and, in some cases, reductions in crime (Heinze et al., 2018; Kvit et al., 2022). However, these effects appear to stem less from the greening itself and more from the social dynamics it activates, such as community stewardship, participation, and informal guardianship (Lorenc et al., 2014; O'Brien et al., 2019; Heinze et al., 2018; Kvit et al., 2022).

This thesis proposes recognizing fear and crime as fundamentally different challenges. While Second-Generation CPTED focuses on social cohesion and Third-Generation CPTED expands to include public health and liveability, both still premise that fear can be addressed through environmental modification (Cozens & Love, 2015; Mihinjac & Saville, 2019). In contrast, this thesis views fear not as something fixed or predictable, but as an interpretive experience shaped by experience, perception, context, and social meaning. Fear, then, is not something to be eliminated but a central concern of design, shaped and reinterpreted through the individual's engagement with space.

In summary, emotional responses to spatial features are not fixed but contextually mediated, shaped by prior experience, cognitive framing, and perceived control (Kaplan & Kaplan, 1989; Herzog & Miller, 1998). Rather than attempting to remove fear, design can support its transformation, creating conditions for curiosity, trust, and resilience. Interpretive environments do not dictate emotional outcomes but afford a range of responses, enabling individuals and communities to navigate complexity and develop adaptive relationships with place.

Ultimately, fear is not removed through design, it is reinterpreted through use. While the built environment cannot determine emotional outcomes, it can afford them, shaping the conditions in which people build trust, form meaning, and cultivate resilience. Landscape and urban design should not aim to suppress emotional complexity but to work with it, crafting environments that invite interaction, co-creation, and emotional transformation. By integrating ecological richness, social engagement, and psychological adaptability, interpretive environments offer a path not to the elimination of fear, but to learn from it.

Conclusion

This thesis set out to answer: first, whether CPTED effectively reduces crime and fear of crime; and second, how contemporary insights into fear can inform urban design. The findings show that while CPTED can modestly reduce crime in certain residential contexts, its broader application is often limited by methodological shortcomings and the tendency to generalise results beyond the scope of specific interventions (Armitage, 2017; Cozens & Love, 2015; Lorenc et al., 2014; O'Brien et al., 2019; Sherman & Eck, 2002). Moreover, much of CPTED's conceptual foundation continues to rely on spatial determinism, which underestimates the complexity of fear as a social and psychological phenomenon (Lorenc et al., 2014; O'Brien et al., 2019).

Fear of crime emerges as a socially and cognitively constructed experience, shaped more by perceptions of trust, control, and social cohesion than by environmental cues alone (Jackson, 2009; LeDoux & Pine, 2014; Lorenc et al., 2014; O'Brien et al., 2019). Drawing on neuroscience and psychology, this thesis argues for a reconceptualisation of fear not as a reflexive response to disorder, but as an interpretive process involving appraisal, memory, and meaning-making (Adolphs, 2013; Carleton, 2016; LeDoux & Pine, 2014; Pessoa, 2017).

Accordingly, it promotes urban design strategies that move beyond attempts to eliminate ambiguity or visible disorder, and instead foster environments that support safe exploration and collective efficacy. In doing so, the built environment can more effectively support both actual and perceived safety. By aligning urban design with how fear is experienced, shaped, and unlearned, we can move toward environments that not only deter harm but actively cultivate resilience. In this way, landscapes can subtly support the emotional mechanisms behind fear extinction, helping users recalibrate their responses through safe but unpredictable encounters. Ultimately, this thesis invites designers, planners, and researchers to reflect on fear not as something environmentally determined but as a socially embedded and cognitively mediated phenomenon, one that requires equally nuanced responses in both research and practice.

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