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Perceived safety in urban green spaces: Environmental affordances, social legibility, and the Chinese urban context

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Abstract

Urban green spaces are widely valued as infrastructure for physical health and psychological restoration, yet they can also be experienced as places of anxiety when fear of crime discourages use. This tension matters for urban planning: even where victimization in parks is relatively uncommon, perceived insecurity can limit access to the benefits of green infrastructure. Existing theories tend to be divided between design-centered approaches, such as Crime Prevention Through Environmental Design, and sociological accounts that emphasize disorder, cohesion, or trauma. This division leaves underexplored the ways in which physical settings mediate social signals. In rapidly urbanizing, high-density Chinese cities, where parks are both spatially constrained and socially active, this relationship is especially visible. Using an integrative review, this article draws on foundational international theories and recent empirical studies of Chinese and other high-density urban green spaces to develop the Situated Perception of Safety model. The model combines environmental affordances and social legibility to understand safety as a situated process of interpretation rather than a fixed property of place. It argues that perceived safety depends on whether users can read signs of care, anticipate possible actions, and interpret encounters with other park users. Therefore, the article shifts attention from a defensive logic of removing risk to a more inclusive logic of cultivating everyday presence, offering a framework for designing urban green spaces that are accessible in both physical and psychological terms.

Keywords: Fear of crime; Urban perception; Environmental psychology; Cognitive processing; Park use behavior; Crime Prevention Through Environmental Design

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1. Introduction

Urban parks occupy an uneasy position in contemporary cities. Planning and environmental-psychology literature often presents green spaces as settings for health, stress relief, and social interaction. Grounded in biophilia and Attention Restoration Theory, this work treats urban greenery as a restorative resource that can support psychological recovery and reduce cognitive fatigue in dense urban life (E. Wilson,

1984; R. Kaplan & Kaplan, 1989; S. Kaplan, 1995). The issue is particularly pressing in rapidly urbanizing Chinese megacities, where green space is limited but heavily used for daily exercise, recuperation, and social cohesion (Wang *et al.*, 2023). At the same time, parks may be avoided when users associate them with vulnerability or victimization. The contrast between the park as a place of restoration and the park as a place of fear is therefore not simply rhetorical; it affects who uses public space and under what conditions. Studies have repeatedly noted a gap between actual and perceived risk: crime levels in parks may be no higher, and sometimes lower, than in other urban settings, yet perceived insecurity continues to deter use, especially among vulnerable groups (Ceccato, 2016). When fear shapes everyday decisions about entering or avoiding a park, the public value of green infrastructure is reduced. Safety in this sense is not only an objective condition but also a perceptual and communicative achievement.

Despite the practical importance of this issue, research on safety in green spaces remains divided across disciplinary traditions. One influential strand, grounded in environmental criminology and Crime Prevention Through Environmental Design (CPTED), treats design as the main lever for reducing risk. It emphasizes variables such as lighting, vegetation density, sightlines, and boundary control, based on the premise that spatial configuration can reduce crime opportunities and support territorial control (Cozens & Love, 2015; Iqbal & Ceccato, 2016; Newman, 1973). This approach has had clear policy influence, but it can also narrow the experience of safety into a list of physical features. In doing so, it may miss how users interpret those features through memory, identity, and everyday experience.

The social-psychological tradition takes a different starting point. It focuses on social disorder, collective efficacy, social capital, and individual trauma, as reflected in Broken Windows theory (J. Wilson & Kelling, 1982). This approach brings human relations back into the discussion, yet it often treats the physical setting as a backdrop rather than as an active mediator of social meaning. As a result, the interaction between spatial form and social interpretation remains insufficiently explained. The literature can describe physical and social conditions separately, but it is less able to show how these conditions mutually produce the experience of safety.

This separation is more than a disciplinary inconvenience; it obscures how safety is perceived in practice. To understand the park experience, landscape architecture and environmental psychology need to be brought into closer conversation. The physical environment does not simply contain social life. It also carries signs that shape how users anticipate other people's behavior. A dense thicket, for example, is not only a physical obstruction; depending on its setting, it may also suggest concealment, neglect, or weak social control. What is needed, then, is an account of how spatial features operate as communicative devices and how social perceptions, in turn, alter the meaning of those features. Such an account can move the debate beyond the familiar opposition between design and society.

This article responds by developing the Situated Perception of Safety (SPS) model. The model integrates environmental affordance theory and social legibility to explain how fear is formed in everyday park use. Rather than listing risk factors, the analysis focuses on the cognitive and affective processes through which users make real-time judgments about safety. Section 2 explains the method used to construct the framework. Section 3 reviews the fragmented literature and identifies the main conceptual gaps. Section 4 presents the SPS model and its two core dimensions: environmental affordances and social legibility. Section 5 considers what this shift from defensible space to inclusive space means for urban design policy and theory. Section 6 concludes the current study.

2. Methodology of theory construction

2.1. Literature selection criteria

This study uses an integrative review combined with narrative synthesis to build a theoretical framework that connects existing but often separate approaches. Unlike systematic reviews that aggregate empirical findings to test predefined hypotheses, an integrative review is well-suited to theory construction and refinement (Whittemore & Knafl, 2005). It allows findings from quantitative studies, qualitative research, and theoretical essays to be read together. The purpose here was not to produce a meta-analysis of crime statistics. Instead, the review traced the development of the idea of perceived safety across fields and identified concepts that could connect the physical, social, and psychological dimensions of park safety.

The search was conducted in Scopus and Web of Science to include peer-reviewed literature relevant to urban safety and green space. Keywords and Boolean combinations covered terms such as perceived safety, fear of crime, urban green space, environmental affordances, social surveillance, and CPTED. To keep the discussion current while retaining the historical foundations of the field, the review prioritized literature published between 2000 and 2025. Foundational works by Jacobs (1961), Lynch (1960), Newman (1973), Appleton (1975), R. Kaplan and Kaplan (1989), S. Kaplan (1995), and E. Wilson (1984) were also retained because they established concepts that

continue to shape contemporary debates. To make the literature selection process more transparent, the search and screening procedure is summarized in a Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)-style flow diagram (Figure 1). The database search focused on peer-reviewed journal articles and review articles, while book chapters, conference articles, and other non-journal publications were excluded before export. In total, 93 records were identified from Web of Science Core Collection and Scopus. After duplicate removal, 60 records remained for title, abstract, and keyword screening. Twenty-three records were excluded at this stage because they were outside the urban green/public open-space context, did not focus on perceived safety or fear of crime, or addressed other unrelated topics. The remaining 37 records were retained for full-text and source verification, and the most conceptually relevant studies were incorporated into the integrative synthesis.

2.2. Analysis framework

The screening process involved several stages. Titles and abstracts were first reviewed to exclude studies focused only on crime-prevention technology or legislation without a spatial or psychological dimension. The

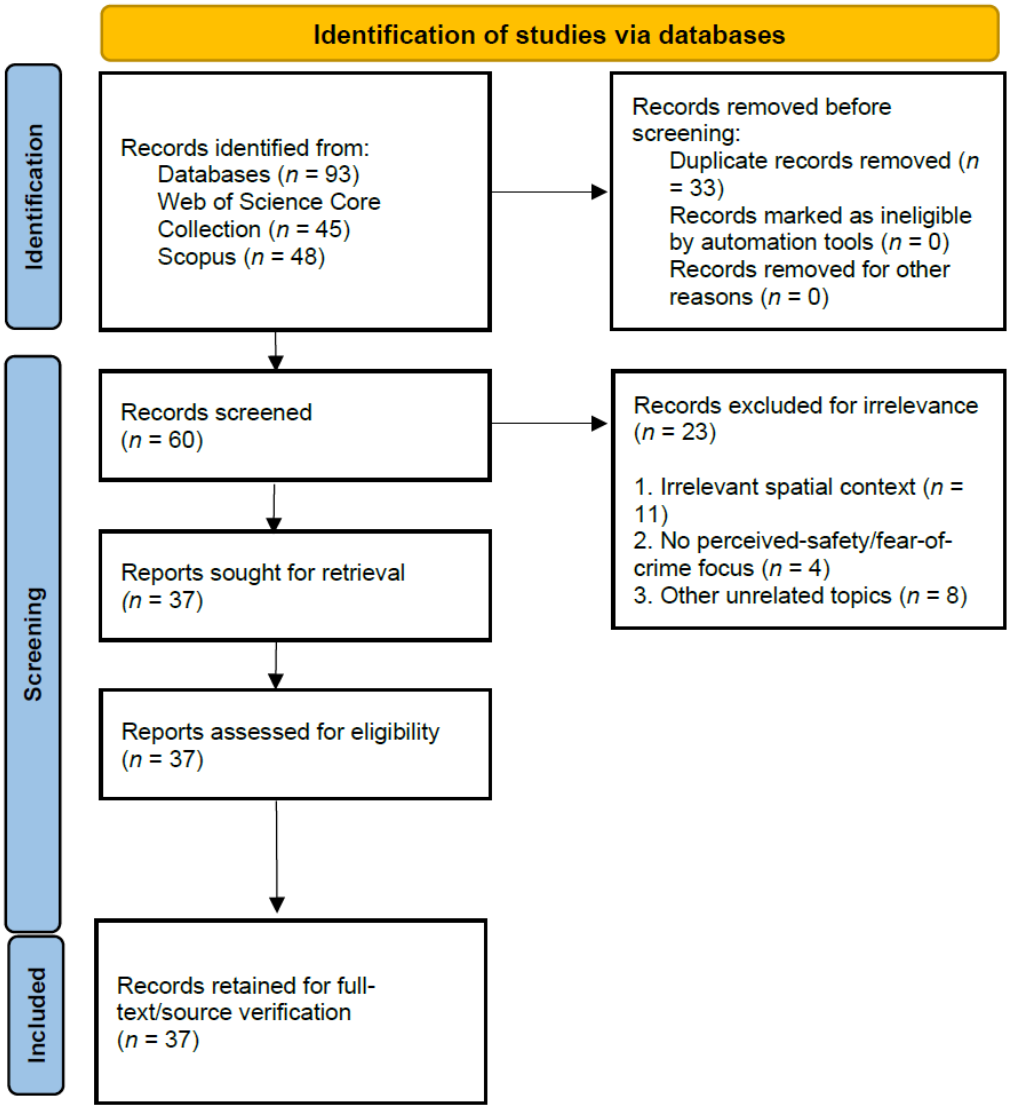


Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses-style flow diagram of literature identification and selection. Source: Diagram by the authors

remaining full texts were then examined for the theoretical assumptions behind their conclusions. This step confirmed the fragmentation noted in the introduction: most studies foreground either physical attributes, such as shrub height and lighting level, or social factors, such as the presence of strangers and signs of incivility, while giving less attention to how these factors interact.

The selected literature was therefore synthesized through conceptual mapping rather than simple summary. Concepts from one field were interpreted in relation to concepts from another, a process of reciprocal translation. In particular, affordance, drawn from ecological psychology, and legibility, drawn from urban design, emerged as useful bridge concepts because they link material form with perception. The analysis organized existing theories into deterministic and socially constructed perspectives, then examined the mechanisms that might mediate between them. This synthesis provides the basis for the SPS model developed in Section 4.

3. Literature review: The fragmentation of safety discourse

3.1. The deterministic view: Physical features and environmental psychology

Research on safety in urban green spaces has often assumed that spatial form strongly shapes perception and behavior. This view draws on evolutionary psychology and Appleton's Prospect-Refuge Theory (Stamps, 2014). Appleton argued that people tend to prefer landscapes that offer both prospects, the ability to see outward, and refuge, a sense of shelter and protection. In parks, fear may increase when this balance is disrupted: users have limited views of their surroundings, while enclosure or poor legibility creates uncertainty about escape, visibility, and potential encounters (Appleton, 1975; El-Metwally *et al.*, 2021; Stamps, 2014). More recent empirical studies have examined these claims with greater precision. C. Li *et al.* (2023), for example, used eye-tracking to show that visual permeability in park vegetation is a strong predictor of perceived safety, sometimes outweighing aesthetic preference. This finding suggests that users may first look for visual access and escape routes before attending to landscape beauty. Broader evidence likewise links perceived security in parks to visibility, wayfinding, maintenance, vegetation density, spatial definition, and the possibility of being seen by others (Mahrous *et al.*, 2018; Sezavar *et al.*, 2023; X. Li *et al.*, 2015). Studies of vegetation and enclosure indicate that safety depends less on the presence of greenery itself than on how vegetation is arranged, how accessible and visible the space is, and whether planting creates concealment or visual obstruction (Baran *et al.*, 2018; Lis & Iwankowski, 2021a; Sezavar *et al.*, 2023; Tabrizian *et al.*, 2018). Evidence from high-density Chinese parks adds further detail to this picture. A spatial evaluation in Xuzhou found that micro-features, such as accessible water bodies, may increase environment-related fear when perceived as unpredictable, whereas distant night-time lighting can reduce fear of the unknown (Zhao & Huang, 2021). At the same time, CPTED principles do not operate in a psychological vacuum. Research on Baitashan Park in Lanzhou suggests that their effects on perceived safety are mediated by users' interpersonal and social needs (Hou *et al.*, 2025). Other studies in Chinese and high-density Asian contexts similarly show that perceived safety is shaped by interactions among CPTED attributes, time spent in the park, gender, parental status, park attachment, and human-environment fear-evoking factors (Hou *et al.*, 2025; Mak & Jim, 2022; X. Chen *et al.*, 2025; X. Chen & Marzbali, 2024).

This line of thinking has been incorporated into CPTED through strategies such as territorial reinforcement, natural surveillance, and access control. Yet a strongly deterministic interpretation has limits, especially when questions of maintenance and care are considered. Nassauer (2011) and Kuo (2011) challenged the assumption that vegetation is inherently associated with crime, arguing instead that cues to care can reduce fear even in dense natural settings. A hedge may be read as a hiding place in a neglected park, but as a sheltered and inviting enclosure in a well-managed garden. Physical form therefore matters, but it cannot fully explain perceived safety without the semiotic context created by maintenance, stewardship, and design intent.

3.2. The social construction of fear: Surveillance, disorder, and cohesion

Alongside CPTED, another body of work treats safety as socially constructed. From this perspective, fear is shaped less by space in isolation than by the social relations and behaviors associated with it. The approach is influenced by Jacobs' (1961) idea of eyes on the street and by Broken Windows theory, which links visible disorder to perceived weakness of community control (J. Wilson & Kelling, 1982). Recent discussions have moved beyond a simple distinction between presence and absence. In their account of Third-Generation CPTED, Mihinjac and Saville (2019) argued that safety also depends on public health, digital connectivity, and belonging, rather than solely on surveillance. They also caution that hard design interventions can weaken the social fabric that enables natural guardianship.

Recent events further complicate the meaning of social density in parks. Whereas eyes on the street is usually

associated with safety, the COVID-19 pandemic turned crowding into a source of bio-anxiety for many users. Noszczyk *et al.* (2022) observed this inversion during lockdowns, when the presence of other park users could reduce rather than increase perceived security. Therefore, fear is context-dependent. Lorenc *et al.* (2013) described it partly through social distance, noting that anxiety often arises from the perceived otherness of strangers rather than from a calculated risk assessment. The weakness of this literature is that it can treat social dynamics as separate from the physical setting, even though design may invite, concentrate, disperse, or discourage particular social behaviors.

3.3. The subjective filter: Identity, experience, and vulnerability

Critiques of both physical and social accounts have produced a third strand of research on the subjective filter: the user characteristics that shape how environments are interpreted. Safety is strongly differentiated by gender and age. Recent studies show that women's perceived safety in parks and public open spaces is mediated by visibility, route choice, built-environment characteristics, and the predictability of surrounding users (Gargiulo *et al.*, 2020; Polko & Kimic, 2022; S. Chen *et al.*, 2024). In Chinese urban parks, perceived safety also varies by gender, parental status, and time spent in the park, suggesting that safety is a situated experience filtered through social role and daily practice as well as design (X. Chen & Marzbali, 2024). Wang et al. (2023) found that young adults' perceptions of safety and emotional restoration are influenced by environmental odors and by the legibility of designated activity areas. These effects also differ by gender and socioeconomic status: dense environmental stressors may increase negative emotions among female users, while lower-income groups rely more heavily on clear and predictable green-space affordances for emotional stability (Wang *et al.*, 2023). Recent work has also shifted the discussion from biological vulnerability to power and inclusion. Hoover and Lim (2021) argued that for marginalized communities, design features meant to signal order, such as bright lighting, cameras, and uniformed patrols, may be read as exclusion or surveillance. The subjective filter, therefore, concerns not only anxiety, but also who feels entitled to occupy public space.

Age and physical ability also shape how park environments are perceived. For older adults and people with limited mobility, fear of crime can be intensified by the perceived difficulty of escaping or defending oneself. Jorgensen and Anthopoulou (2007) noted that vulnerability changes the affordance of the landscape: a steep slope or uneven path is not merely a physical feature but a potential obstacle to withdrawal. Prior victimization can work similarly, leading users to read otherwise neutral cues as warning signs. These studies show that safety is not a single objective quality of a park, but a psychological state formed through identity, experience, and bodily capacity. However, this literature often identifies who is afraid more clearly than it explains how design might respond to diverse forms of vulnerability.

3.4. Synthesis of gaps: Toward a dynamic interactionism

Taken together, these three research streams leave an important theoretical gap. Physical features, social conditions, and individual characteristics are often treated as separate variables rather than as elements of a situated process. A study may show that lighting is associated with safety or that women report higher levels of fear, but such findings do not fully explain why a well-lit path may still feel unsafe if it is socially isolated, or why a dense wooded area may feel safe during a festival. Existing approaches, therefore, lack a shared language for explaining how a physical feature becomes a social signal and how that signal is filtered through individual cognition. The task is not only to list correlates of fear, but to explain perception as it unfolds. The SPS model addresses this gap by treating safety not as an attribute of the park but as a communicative event: a negotiation between environmental affordances and the legibility of the social landscape.

4. The situated perception of safety model

Building on the preceding critique, this article proposes the SPS model as an integrated framework (Figure 2). The model moves away from the idea that safety is a fixed property of the built environment. It defines safety instead as a cognitive and emotional state that emerges as users interpret physical settings and social situations in real time. The SPS model argues that perceived safety depends on the alignment between two dimensions: Environmental affordances, or the action possibilities offered by the setting, and social legibility, or the clarity with which users can read social norms and likely behavior. These dimensions pass through cognitive processing and produce behavioral outcomes, which then feed back into the environment through use, avoidance, maintenance, and social surveillance.

4.1. Dimension 1: Environmental affordances

The first dimension of the SPS model reframes the physical components of parks through the lens of affordance theory. In conventional CPTED discussions, park features are often described as discrete elements: lighting, vegetation, paths, furniture, and boundaries. Users, however, do not

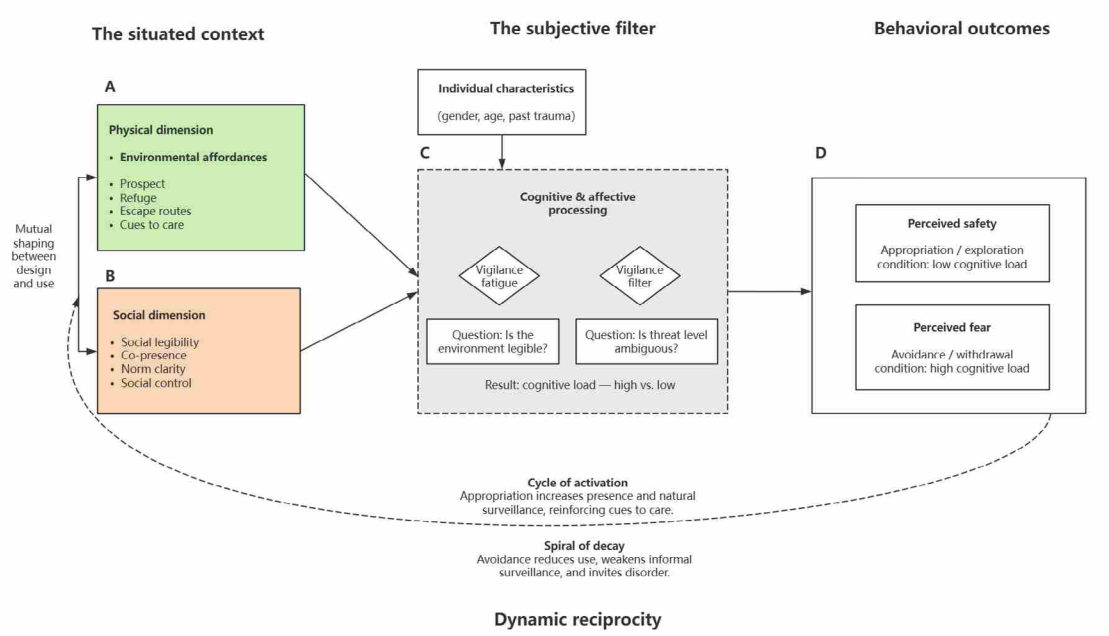


Figure 2. The conceptual framework of the situated perception of safety (SPS) model. Source: Diagram by the authors

experience these elements only as objects. They experience them as action possibilities. A dense shrub, for example, may afford concealment for a potential attacker, but it may also afford privacy for a couple or a quiet place for retreat. Studies of park vegetation support this ambivalence, showing that the same greenery can be evaluated positively or negatively depending on whether it affords visibility, concealment, privacy, mystery, or safe movement (Lis & Iwankowski, 2021a; Sezavar *et al.*, 2023). Withagen and Caljouw (2017) suggested that action-relevant affordances attract attention more quickly than aesthetic qualities. In park settings, users may therefore scan first for prospects, escape, and concealment before responding to the beauty of the landscape.

In the SPS framework, safety depends less on the isolated feature than on the balance between prospect affordances, such as seeing and being seen, and entrapment affordances, such as being enclosed without a clear exit. The physical environment also communicates care. Nassauer's (2011) concept of cues to care is useful here: a trimmed edge, a repaired bench, or the absence of graffiti can signal that the space is monitored and maintained. Similarly, defensible space, CPTED, and cues-to-care scholarship suggest that spatial form and visible maintenance cues help users judge whether a space is cared for, monitored, and legitimately used (Cozens & Love, 2015; Nassauer, 2011; Newman, 1973). These cues provide social reassurance by reducing the sense of randomness. In this way, the physical dimension is not passive. It communicates territorial integrity, stewardship, and possible action.

4.2. Dimension 2: Social legibility

The second dimension, social legibility, extends Lynch's (1960) concept of legibility from wayfinding to social interpretation. Lynch was concerned with whether people could read the city for navigation. The SPS model asks whether users can read the social situation of a park. Safety depends heavily on predictability. Sreetheran and van den Bosch (2014) showed that fear is intensified in environments that lack cognitive clarity, because potential threats become harder to interpret. A socially legible environment is one in which users can reasonably infer the norms, intentions, and likely behavior of others. Fear often arises not from crime itself but from ambiguity: encounters with other users cannot be categorized, distances are unclear, or concealment makes intentions difficult to read (Lis & Iwankowski, 2021b; Lorenc *et al.*, 2013; Mak & Jim, 2022). An unfamiliar group in a poorly lit area with no clear function may therefore feel threatening because the social meaning of the situation is uncertain.

Design can either sharpen or weaken this social readability. Studies of city parks show that legibility, naturalness, vegetation quantity, visibility of other users, and perceived danger are closely connected, suggesting

that social legibility is produced through spatial form and the interpretability of co-present users (Lis & Iwankowski, 2021b; Mak & Jim, 2022). Spatial layout affects which groups encounter one another, while affordance-based zoning can distinguish spaces for active play, quiet rest, and social gathering. Clear activity zones make encounters easier to anticipate and interpret; conversely, functionally ambiguous areas can make social behavior harder to read. Therefore, the SPS model treats design as a means of making the social environment more readable, so that strangers become part of an interpretable public setting rather than an undefined threat.

4.3. The mediation mechanism: Vigilance fatigue and cognitive processing

The relationship between environmental affordances and social legibility is mediated by cognitive and affective processing. The SPS model uses the term vigilance fatigue to describe this mechanism. Human attention is limited. When a park offers negative affordances, such as multiple hiding places, and when social encounters are difficult to interpret, users may enter a state of heightened vigilance. They must scan for threats, decode ambiguous cues, and keep possible exits in mind. Sustained vigilance is cognitively costly because it requires continuous directed attention to potential threats, exits, and ambiguous social cues. When users must remain in this mode of monitoring, the restorative potential of the park is weakened rather than realized (R. Kaplan & Kaplan, 1989; S. Kaplan, 1995).

From this perspective, safety is not simply the absence of danger; it is the absence of a constant need to monitor for danger. When visibility, escape routes, and social cues are clear, users can lower their guard and experience the soft fascination associated with restoration. When design requires persistent alertness, the psychological cost of using the park may outweigh its benefits. This helps explain why some parks with low crime rates remain underused. They may be statistically safe, but the effort required to read and navigate them produces fatigue, unease, and avoidance.

4.4. The dynamic feedback loops: The spiral of decline vs. the cycle of activation

The SPS model also places these processes in time. Perceived safety develops through repeated interactions among design, perception, and behavior. When sightlines are blocked, users may judge an area as demanding greater vigilance and begin to avoid it. Lower use then weakens informal surveillance, including the ordinary presence that Jacobs (1961) described as eyes on the street. As legitimate activity declines, the space may become more vulnerable to vandalism or other misuse. Physical deterioration reduces visible cues of care and strengthens the impression of abandonment. Over time, these changes increase negative affordances, reduce social legibility, and produce a self-reinforcing spiral of decline.

The same feedback loop can also move in the opposite direction, forming a cycle of activation. Targeted interventions can improve affordances and reduce the cognitive cost of vigilance, for example, by pruning vegetation to open sightlines, as suggested by Jansson *et al.* (2013), or by improving lighting at key nodes. A greater presence increases social legibility and informal surveillance, further strengthening cues to care. The design focus shifts from fortifying parks against potential offenders to activating them for everyday users. In this model, one of the strongest safety measures is the sustained, visible presence of diverse users engaged in recognizable activities, as shown in Figure 3.

5. Discussion: Paradigm shifts in urban design

5.1. From defensible space to inclusive space

The SPS model calls for a move away from the Fortress Park mentality associated with Newman's (1973) Defensible Space. Traditional target-hardening strategies, such as fences and vegetation removal, aim to reduce opportunities for crime through direct mechanical means. The SPS model draws attention to their unintended consequences. By reducing permeability and everyday use, such measures can make social situations less legible. Mihinjac and Saville (2019) made a related argument, suggesting that militarized public space can damage the social fabric on which natural guardianship depends. A park that appears heavily fortified may therefore signal hostility and increase the vigilance fatigue it was meant to reduce.

In contrast, the SPS model supports a shift toward Inclusive Space. Safety is enhanced not simply by controlling access, but by making legitimate use visible and intelligible. Pafka and Dovey (2017) showed that spatial permeability increases the frequency of diverse, temporary encounters, which helps users read social norms. Connecting park edges to active street frontages and reducing hard boundaries can extend Jacobs' principle of eyes on the street into the park itself. This view is consistent with Carmona's (2019) argument that place quality and safety depend on a space's integration into urban life rather than on its isolation. In the SPS framework, safety is therefore not the exclusion of all risk, but the cultivation of legitimate co-presence.

5.2. Policy and design implications: Operationalizing social visibility

Putting the SPS model into practice requires designers to prioritize social visibility over hierarchical surveillance.

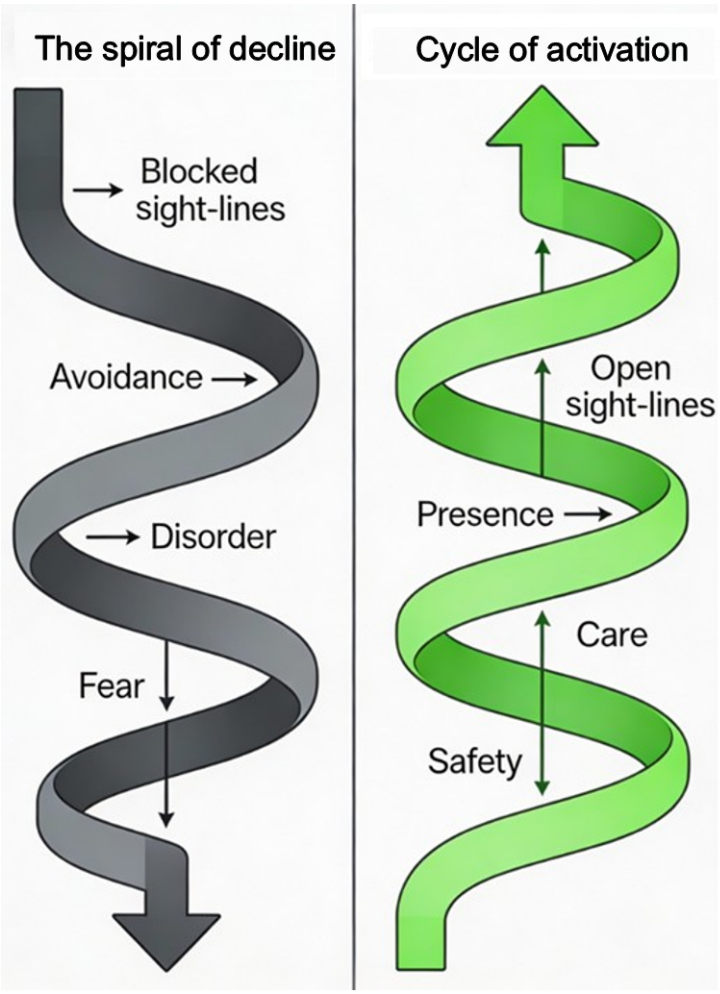


Figure 3. From spiral of decline to cycle of activation. Source: Diagram by the authors

Social visibility is lateral and reciprocal: users see and are seen by one another. Therefore, vegetation management needs to move beyond the simple choice of keeping or removing planting. Rather than treating dense vegetation as a problem by default, designers can use Nassauer's (2011) cues to strategically care for it. A thicket that affords concealment can still be considered an ecological asset if it maintains edges, clear paths, and visible signs of stewardship. This approach balances prospect and immersion by making complexity appear managed rather than abandoned. Existing research also indicates that perceived safety is influenced by vegetation density, maintenance, spatial coherence, physical and visual accessibility, and whether vegetation supports or blocks prospect (Mahrous *et al.*, 2018; Sezavar *et al.*, 2023).

Lighting policy should likewise shift from a narrow focus on intensity to a broader concern with spatial distribution. Haans and de Kort (2012) showed that perceived safety improves when lighting supports prospect, rather than merely brightening the ground plane. Lighting should therefore reduce spatial ambiguity and help users read surrounding social cues. Recent park-lighting research also suggests that night-time safety depends on how lighting supports orientation, visibility, preference, and interpretation of nearby social situations (Haans & de Kort, 2012; Lis *et al.*, 2023). Social programming should be treated as safety infrastructure as well. Peters *et al.* (2010) showed that the visible presence of diverse social groups can validate safety by signaling shared norms. In Chinese urban parks, dense and intergenerational activities, such as senior fitness groups and youth gatherings, may make social encounters more visible and predictable. Such everyday use can strengthen social legibility, support informal surveillance, and reduce perceived opportunities

for disorder. Policies that encourage legitimate lingering, such as food vendors or movable furniture, can also activate underused areas. Over time, spaces once avoided may become more legible and more actively used, consistent with the feedback logic of the SPS framework.

5.3. Theoretical Implications: The cognitive turn in Crime Prevention Through Environmental Design

Theoretically, the SPS model contributes to CPTED development by foregrounding cognitive processing. First-Generation CPTED emphasized physical design, while Second-Generation CPTED brought in social cohesion. The SPS framework aligns with Third-Generation CPTED but specifies one mechanism through which design affects experience: vigilance fatigue. This extension is consistent with recent park-based CPTED studies showing that CPTED attributes need to be interpreted through users' perceived security, park attachment, social needs, and context-specific environmental variables rather than treated as universal prescriptions (Hou *et al.*, 2025; Iqbal & Ceccato, 2016; Mehta & Gopalakrishnan, 2024; X. Chen *et al.*, 2025). Rather than viewing users as rational calculators of risk, the SPS model understands them as cognitive agents with limited attentional resources who continuously negotiate environmental affordances.

This shift can be described as a cognitive turn in safety research. It suggests that safety should not be assessed only through crime statistics, but also through cognitive ease: the extent to which people can use a space without sustained uncertainty or vigilance. Therefore, future research needs methods that move beyond static crime mapping and examine how users interpret spatial signals while moving through parks. By linking material affordances with social legibility, the SPS model argues that good urban design reduces the cognitive cost of participation and makes public space easier to inhabit.

6. Conclusion

This study began with a central paradox: urban parks are designed as places of restoration, yet they are sometimes experienced as places of anxiety. The integrative review showed that existing theories are limited by a persistent divide between environmental determinism and social constructivism. Traditional CPTED often reduces safety to physical fortification, while social-psychological approaches may understate the agency of material form. The SPS model addresses this divide by bringing environmental affordances together with social legibility. It shows that safety is not inherent in a bench, a path, or a grove of trees. Rather, it is produced through an ongoing process in which users read action possibilities, social cues, and signs of care.

The main contribution of this study is to shift the design goal from eliminating risk to cultivating presence. The SPS model's feedback logic suggests that defensive fortification can be counterproductive when it weakens permeability, reduces social legibility, and increases vigilance fatigue. In contrast, Inclusive Space treats safety as an emergent outcome of visible, legitimate, and diverse use. This reframes the role of landscape architects: they are not only gatekeepers of security but also facilitators of co-presence. A well-placed bench that invites an older resident to sit, watch, and claim the space may contribute more to perceived safety than a surveillance camera alone. This theoretical shift offers a foundation for a third-generation CPTED approach that connects physical design with social equity and psychological well-being.

Although the SPS model offers a theoretical framework, its mechanisms require further empirical testing. Future research should move beyond self-report surveys, which are vulnerable to recall bias, and incorporate physiological and spatially precise methods. Wearable biometric sensors, such as mobile electroencephalography or heart-rate monitors, combined with geolocated tracking, could help map stress responses as users move through park environments. Aspinall *et al.* (2015) showed how such psychogeographical methods can identify where cognitive fatigue emerges. Immersive Virtual Reality (IVR) also allows manipulation of specific affordances, such as vegetation density and lighting, under controlled conditions. Existing immersive environment studies have examined perceived safety and restoration in relation to park enclosure, vegetation, and spatial configuration, suggesting that similar designs could test social legibility and vigilance fatigue within the SPS framework (Baran *et al.*, 2018; Tabrizian *et al.*, 2018). Combined with the SPS model, these methods can support a more precise understanding of how to design green spaces that are not only physically accessible but also psychologically welcoming.

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Conflict of interest

The authors declare no conflicts of interest.

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Ethics approval and consent to participate

Not applicable.

Consent for participation

Not applicable.

Availability of data

Data are available from the corresponding author upon reasonable request.

Further disclosure

During the preparation of this manuscript, the authors used AI-assisted tools only for translation support and post-translation language editing to improve clarity, readability, and grammatical accuracy.

References

Appleton, J. (1975). *The experience of landscape*. Hoboken, NJ: Wiley.

Aspinall, P., Mavros, P., Coyne, R., & Roe, J. (2015). The urban brain: analysing outdoor physical activity with mobile EEG. *British Journal of Sports Medicine*, *49*(4), 272–276.

https://doi.org/10.1136/bjsports-2012-091877

Baran, P. K., Tabrizian, P., Zhai, Y., Smith, J. W., & Floyd, M. F. (2018). An exploratory study of perceived safety in a neighborhood park using immersive virtual environments. *Urban Forestry & Urban Greening*, *35*, 72–81.

https://doi.org/10.1016/j.ufug.2018.08.009

Carmona, M. (2019). Place value: Place quality and its impact on health, social, economic and environmental outcomes. *Journal of Urban Design*, *24*(1), 1–48.

https://doi.org/10.1080/13574809.2018.1472523

Ceccato, V. (2016). Public space and the situational conditions of crime and fear. *International Criminal Justice Review*, *26*(2), 69–79.

https://doi.org/10.1177/1057567716639099

Chen, S., Lin, S., Yao, Y., & Zhou, X. (2024). Urban public space safety perception and the influence of the built environment from a female perspective: Combining street view data and deep learning. *Land*, *13*(12), 2108.

https://doi.org/10.3390/land13122108

Chen, X., & Marzbali, M. H. (2024). How urban park features impact perceived safety by considering the role of time spent in the park, gender, and parental status. *Cities*, *153*, 105272.

https://doi.org/10.1016/j.cities.2024.105272

Chen, X., Marzbali, M. H., & Armitage, R. (2025). Perceived safety in urban parks: CPTED, place attachment and the COVID-19 paradigm. *Environment, Development and Sustainability*, 1–26.

https://doi.org/10.1007/s10668-025-06865-2

Cozens, P., & Love, T. (2015). A review and current status of crime prevention through environmental design (CPTED). *Journal of Planning Literature*, *30*(4), 393–412.

https://doi.org/10.1177/0885412215595440

El-Metwally, Y., Khalifa, M., & Elshater, A. (2021). Quantitative study for applying prospect-refuge theory on perceived safety in Al-Azhar Park, Egypt. *Ain Shams Engineering Journal*, *12*(4), 4247–4260.

https://doi.org/10.1016/j.asej.2021.04.016

Gargiulo, I., Garcia, X., Benages-Albert, M., Martinez, J., Pfeffer, K., & Vall-Casas, P. (2020). Women's safety perception assessment in an urban stream corridor: Developing a safety map based on qualitative GIS. *Landscape and Urban Planning*, *198*, 103779.

https://doi.org/10.1016/j.landurbplan.2020.103779

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception: Classic Edition*. Boston, MA: Houghton Mifflin.

Haans, A., & De Kort, Y. A. (2012). Light distribution in dynamic street lighting: Two experimental studies on its effects on perceived safety, prospect, concealment, and escape. *Journal of Environmental Psychology*, *32*(4), 342–352.

https://doi.org/10.1016/j.jenvp.2012.05.006

Hoover, F. A., & Lim, T. C. (2021). Examining privilege and power in US urban parks and open space during the double crises of antiblack racism and COVID-19. *Socio-Ecological Practice Research*, *3*(1), 55–70.

https://doi.org/10.1007/s42532-020-00070-3

Hou, F., Marzbali, M. H., Maghsoodi Tilaki, M. J., & Abdullah, A. (2025). Rethinking urban greening: Implications of crime prevention through environmental design for enhancing perceived safety in Baitashan park, Lanzhou. *Urban Science*, *9*(1), 9.

https://doi.org/10.3390/urbansci9010009

Iqbal, A., & Ceccato, V. (2016). Is CPTED useful to guide the inventory of safety in parks? A study case in Stockholm, Sweden. *International Criminal Justice Review*, *26*(2), 150-168.

https://doi.org/10.1177/1057567716639353

Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York, NY: Random House.

Jansson, M., Fors, H., Lindgren, T., & Wiström, B. (2013). Perceived personal safety in relation to urban woodland vegetation–A review. *Urban Forestry & Urban Greening*, *12*(2), 127–133.

https://doi.org/10.1016/j.ufug.2013.01.005

Jorgensen, A., & Anthopoulou, A. (2007). Enjoyment and fear in urban woodlands–Does age make a difference?. *Urban Forestry & Urban Greening*, *6*(4), 267–278.

https://doi.org/10.1016/j.ufug.2007.05.004

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge, UK: Cambridge university press.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169-182.

https://doi.org/10.1016/0272-4944(95)90001-2

Kuo, F. E. (2011). Parks and other green environments: 'essential components of a healthy human habitat'. *Australasian Parks and Leisure*, *14*(1), 10–12.

Li, C., Du, C., Ge, S., & Tong, T. (2023). An eye-tracking study on visual perception of vegetation permeability in virtual reality forest exposure. *Frontiers in Public Health*, *11*, 1089423.

https://doi.org/10.3389/fpubh.2023.1089423

Li, X., Zhang, C., & Li, W. (2015). Does the visibility of greenery increase perceived safety in urban areas? Evidence from the place pulse 1.0 dataset. *ISPRS International Journal of Geo-Information*, *4*(3), 1166–1183.

https://doi.org/10.3390/ijgi4031166

Lis, A., & Iwankowski, P. (2021a). Why is dense vegetation in city parks unpopular? The mediative role of sense of privacy and safety. *Urban Forestry & Urban Greening*, *59*, 126988.

https://doi.org/10.1016/j.ufug.2021.126988

Lis, A., & Iwankowski, P. (2021b). Where do we want to see other people while relaxing in a city park? Visual relationships with park users and their impact on preferences, safety and privacy. *Journal of Environmental Psychology*, *73*, 101532.

https://doi.org/10.1016/j.jenvp.2020.101532

Lis, A., Zienowicz, M., Kukowska, D., Zalewska, K., Iwankowski, P., & Shestak, V. (2023). How to light up the night? The impact of city park lighting on visitors' sense of safety and preferences. *Urban Forestry & Urban Greening*, *89*, 128124.

https://doi.org/10.1016/j.ufug.2023.128124

Lorenc, T., Petticrew, M., Whitehead, M., Neary, D., Clayton, S., Wright, K., Thomson, H., Cummins, S., Sowden, A. and Renton, A. (2013). Fear of crime and the environment: systematic review of UK qualitative evidence. *BMC Public Health*, *13*(1), 496.

https://doi.org/10.1186/1471-2458-13-496

Lynch, K. (1960). *The Image of the City*. Cambridge, MA: MIT Press.

Mahrous, A. M., Moustafa, Y. M., & Abou El-Ela, M. A. (2018). Physical characteristics and perceived security in urban parks: Investigation in the Egyptian context. *Ain Shams Engineering Journal*, *9*(4), 3055–3066.

https://doi.org/10.1016/j.asej.2018.07.003

Mak, B. K., & Jim, C. Y. (2022). Contributions of human and environmental factors to concerns of personal safety and crime in urban parks. *Security journal*, *35*(1), 263–293.

https://doi.org/10.1057/s41284-020-00277-9

Mehta, D., & Gopalakrishnan, P. (2024). A user-centric CPTED-based approach to investigate physical environmental variables influencing perceived security of urban park users in Tiruchirappalli, India. *Journal of Design and Built Environment*, *24*(1), 33–52.

https://doi.org/10.22452/jdbe.vol24no1.3

Mihinjac, M., & Saville, G. (2019). Third-generation crime prevention through environmental design (CPTED). *Social Sciences, 8*(6), 182.

https://doi.org/10.3390/socsci8060182

Nassauer, J. I. (2011). Care and stewardship: From home to planet. *Landscape and Urban Planning*, *100*(4), 321–323.

https://doi.org/10.1016/j.landurbplan.2011.02.022

Newman, O. (1973). *Defensible space: Crime prevention through urban design*. New York, NY: Collier Books.

Noszczyk, T., Gorzelany, J., Kukulska-Kozieł, A., & Hernik, J. (2022). The impact of the COVID-19 pandemic on the importance of urban green spaces to the public. *Land Use Policy*, *113*, 105925.

https://doi.org/10.1016/j.landusepol.2021.105925

Pafka, E., & Dovey, K. (2017). Permeability and interface catchment: measuring and mapping walkable access. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, *10*(2), 150–162.

https://doi.org/10.1080/17549175.2016.1220413

Peters, K., Elands, B., & Buijs, A. (2010). Social interactions in urban parks: Stimulating social cohesion? *Urban Forestry & Urban Greening*, *9*(2), 93–100.

https://doi.org/10.1016/j.ufug.2009.11.003

Polko, P., & Kimic, K. (2022). Gender as a factor differentiating the perceptions of safety in urban parks. *Ain Shams Engineering Journal*, *13*(3), 101608.

https://doi.org/10.1016/j.asej.2021.09.032

Sezavar, N., Pazhouhanfar, M., Van Dongen, R. P., & Grahn, P. (2023). The importance of designing the spatial distribution and density of vegetation in urban parks for increased experience of safety. *Journal of cleaner production*, *403*, 136768.

https://doi.org/10.1016/j.jclepro.2023.136768

Sreetheran, M., & Van Den Bosch, C. C. K. (2014). A socio-ecological exploration of fear of crime in urban green spaces–A systematic review. *Urban forestry & urban greening*, *13*(1), 1–18.

https://doi.org/10.1016/j.ufug.2013.11.006

Stamps, A. (2014). *Literature Review of Prospect and Refuge Theory: the first 214 references.* Institute of Environmental Quality.

https://doi.org/10.13140/2.1.4642.6249

Tabrizian, P., Baran, P. K., Smith, W. R., & Meentemeyer, R. K. (2018). Exploring perceived restoration potential of urban green enclosure through immersive virtual environments. *Journal of Environmental Psychology*, *55*, 99–109.

https://doi.org/10.1016/j.jenvp.2018.01.001

Wang, J., Liu, N., Zou, J., Guo, Y., & Chen, H. (2023). The health perception of urban green spaces and its emotional impact on young adults: an empirical study from three cities in China. *Frontiers in Public Health*, *11*, 1232216.

https://doi.org/10.3389/fpubh.2023.1232216

Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of Advanced Nursing*, *52*(5), 546–553.

https://doi.org/10.1111/j.1365-2648.2005.03621.x

Wilson, E. O. (1984). *Biophilia*. Harvrd Cambridge, MA: Harvard University Press.

Wilson, J. Q., & Kelling, G. L. (1982). Broken Windows. *The Atlantic Monthly, 249*, 29–38.

Withagen, R., & Caljouw, S. R. (2017). Aldo van Eyck's playgrounds: Aesthetics, affordances, and creativity. *Frontiers in Psychology*, *8*, 1130.

https://doi.org/10.3389/fpsyg.2017.01130

Zhao, J., & Huang, Y. (2021). Physical characteristics of urban green spaces in relation to perceived safety. *Journal of Urban Planning and Development*, *147*(4), 05021032.

https://doi.org/10.1061/(ASCE)UP.1943-5444.0000742