Research Article

Building Design Parameters for the Safety of Individuals with Autism Spectrum Disorder

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Building secure environments is becoming a critical measure as global crime rates are constantly on the rise, whether at the level of national policy or inside the safety of our own homes. Conservations and discussions on crime against women, children, and the elderly have been at the forefront for the longest time, while the injustice against individuals with disabilities continues to remain in the shadows.

Individuals with disabilities are severely vulnerable to criminal violence, mistreatment, and victimization. This paper focuses on the crime against individuals with Autism Spectrum Disorder and its prevention.

Individuals with Autism may feel sensorially overwhelmed in public spaces, leading to a huge risk of them losing their way or other adverse scenarios due to cognitive (and physical) disorientation.

Hence, the built environment plays an important role in generating a sense of stability as well as security for a comfortable experience for individuals with all kinds of disabilities, be it of visible or invisible kind.

Further, there may be traits associated with Autism that increase or decrease an individual's tendency to breach the law. They may struggle to regulate their aggressive behaviour and emotions and misinterpret other people's standpoints. They could exhibit problematic behaviours which draw the authorities, such as law enforcement, into the picture. Nevertheless, individuals with ASD also regard laws and norms to be beneficial in the context of comfortable, non-threatening surroundings.

The methodology of this research paper aims to study the sense of safety generated by the built environment within an individual with Autism and their response. Further, analysis has been included on how a secure environment can be designed, keeping security systems in perspective. Although there is a growing body of knowledge on this subject, the best design practices as still unclear.

Thus, this research aims to uncover and establish parameters essential to create a safe and secure built environment for individuals with ASD.

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1. Introduction

A safe built environment is an outcome of a human-centric building design approach that is not only accessible but inclusive and efficient in multiple respects. Individuals with disabilities face the brunt of fast-paced urbanization, contributing to a significant increase in misconduct towards individuals. Crime and corruption are inevitable in a developing country, especially where there is a lack of strict regulations. A framework to create safe and secure built environments is imperative to establish a sense of relief among individuals who are more prone to be victims of adversities of this nature. In the case of individuals with disabilities, per se, those belonging to the umbrella of neurodiversity, crime comes much later or may be manifested in the form of general misconduct. Individuals with Autism may be considered the weakest in the shadow of crime, in the sense that their general comprehension of the surroundings is only poor and implicates negative nuances on and through their behavioural responses.

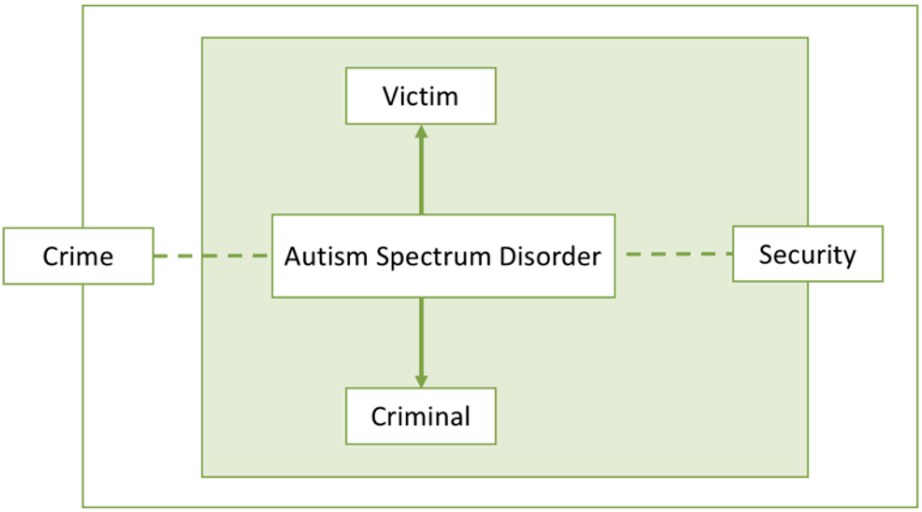

Fig.1. Relation between Autism and Crime

Source: Author

A sense of security does not exist only on the physical level but also at the mental and social level. Initiatives for the safety of individuals with a visible disability are being incorporated into the public sphere, while the case of invisible disabilities, such as Autism, is still being established. According to Maslow's hierarchy of needs (Fig 2.), mentioned in his paper- "A Theory of Human Motivation", published in 1943, the needs he discusses are crucial to human survival, out of which safety needs come in second place after physiological needs (Maslow's Hierarchy of Needs Theory, 2022).

Fig.2. Maslow's Hierarchy of Needs

Source: Simply Psychology

Globally, there are about 1000 million persons with disabilities, or around 15% of the world's population, or one in every seven people. Between 110 million to 190 million of these individuals struggle significantly with daily functioning. A moderate or severe impairment is expected to affect 93 million children, or one in every twenty children under the age of 15. As populations age and the prevalence of chronic health issues rises worldwide, the number of individuals who experience impairment will continue to rise. Trends in environmental circumstances, health conditions, and other causes, such as traffic accidents, falls, violence, humanitarian catastrophes, including natural disasters and armed conflict, unhealthful diets, and drug addiction, affect national patterns of disability (Organization, 2015).

Approximately 15% of adults in the world have a disability, apart from which there is an increasing number of the aging population. The concerned aging population is also at a high risk of disability with an exponential rise in cardiovascular, mental, and other such illnesses (Organization, 2011).

As human is part of a biodiverse system, a lot of environmental and social factors are responsible for this phenomenon., with the recognition that "disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others" (Hughes et al., 2012).

2. Risk Factors for Individuals with Disabilities

Around half a million adults become victims of interpersonal violence and end up losing their lives, while a few are subjected to adversities from socio-occupational consequences. Various factors, in the case of individuals with

disabilities, contribute to their increased suffering in criminal offenses (Saxton et al., 2001). A few of them include exclusion from learning opportunities and employment, the need for day-to-day personal assistance, reduced physical and emotional defenses, comprehension and communication barriers that hamper the reporting of crime, societal stigma, and discrimination (Hughes et al., 2012). Some risk factors are mentioned in Table 1.

Type of Disability	Risk Factor
Physical Disability	A person with a physical disability may need assistance from others to meet their basic needs. Caregivers can play an important role in intimate care routines such as bathing, washroom, and grooming, which may give them opportunities for harming the individuals.
Cognitive Disability	A person with a cognitive disability may showcase too much faith in others and may become a victim of trickery or bribery. The person may not know the differences between sexual and non-sexual touches and not know that sexual violation is not all right.
Learning Disability	A person who has a disability that impacts their ability to communicate faces additional barriers to disclose abuse or assault.

Table 1. Types of disabilities and risks involved

Source: The Arc's Autism Now Center, 2023

The media captures the plight of individuals with disabilities to a large extent by reporting cases of sexual abuse, bullying and other major forms of hate crimes in different environmental settings ranging from homes to public spaces (Shamash, 2013). In a country such as India, it is a task to quantify the extent of crimes against individuals with a disability, as the definitions of both these terms (crime and disability) are open-ended. However, the first step in the prevention of the crime so mentioned is acknowledging the existence and magnitude of the crime. This information will only be fruitful if the following four-step approach is undertaken:

- Step 1: Identification of the individuals with disabilities in the country. (Followed by listing their details at the city level).
- Step 2: Identification of the needs, risk factors, and violence faced by individuals with different disabilities. (This includes documentation of their experiences and requirements).
- Step 3: Designing the built environment such that it not only provides comfort but also establishes a sense of security among people (including caregivers).
- Step 4: Lastly, it is important to set up a system of communication in public as well as private buildings- especially in the case of an emergency.

In many cases, individuals with a disability may inflict self-harm or harm those around them as well (The Arc's Autism Now Center, 2023). This is most prominent in the case of individuals with Autism Spectrum Disorder and other neurodivergent conditions. Multiple factors create hostile situations and can result in unfavourable consequences, as listed in Table 2.

Factors causing Threats	Unfavourable Consequences
People with disabilities are asked to be obedient, passive, respectful and to keep negative behaviours in check. This is called compliance training.	Abusers take advantage of abusing these individuals by tricking them into harmful and abusive situations.
People with disabilities sometimes grow up without sex education, abuse prevention information, or assertiveness education.	People with disabilities may not be aware of their bodies, healthy sexual boundaries, or how to know if someone is being abusive.
A person with a mental health condition may be disoriented, leading to a lack of differentiation between reality and non-reality from their mental health symptoms.	An abusive person may take advantage of or harm an individual with a mental condition.

Table 2. Threats leading to unfavourable consequences
Source: The Arc's Autism Now Center, 2023

3. Society and Disabilities

Individuals showcasing disabilities have been subjected to dreadful human rights violations in the past. Yet despite well-documented and extensive regulations for the welfare of mankind, one billion persons with disabilities remain neglected by the international laws, legal processes, and institutions that seek to amend the cause of those violations, including crimes against humanity (Pons et al., 2021). Early case studies suggest an association between Autism Spectrum Disorder and violence (Baron-Cohen, 1988; Mawson et al., 1985).

3.1. Individual with Autism as a criminal

In many instances, individuals with Autism may resort to self-harm or may cause harm to the environment by being triggered due to unfavourable environmental conditions. The difficulties in cognition of individuals with Autism adversely affect their responses in society. There have been a lot of cases of individuals with Autism offending the US Criminal Justice System (Blackmore et al., 2022).

3.2. Individual with Autism as a victim

A lot of information is available on interpersonal violence, child maltreatment, and bullying of individuals with Autism Spectrum conditions, which can further be classified as intimate partner violence, youth peer pressure, and other forms of victimization. (Hamby & Grych, 2012) As it is, individuals with Autism have a lot of impairments in social communication and social interaction across multiple contexts and showcase constrained interests and/or repetitive body movements and mannerisms. (Association, 2022).

4. CPTED and the Built Environment

4.1. Global Guidelines

The Preamble from the Convention on the Rights of Persons with Disabilities (CRPD) quotes, “Recognizing that women and girls with disabilities are often at greater risk, both within and outside the home, of violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation”, (United Nations, 2008). This statement might appear to hold relevance only in the case of women and girls. However, it has proven to be crucial for the complete umbrella of disabilities. The UNCRPD states that people with disabilities have an equal right to social protection. Safety nets are a type of social protection intervention that focuses on vulnerability and poverty (United Nations, 2007).

In the Indian context, Chapter 5: Social Security, Health, Rehabilitation, and Recreation, of The Rights of Persons with Disabilities Act talks about “Social Security” as a key driving force in the survival of individuals with disabilities, while Chapter 2: Rights and Entitlements, looks into their protection and safety (*The Rights of Persons With Disabilities Act, 2016*, 2016).

S.No.	Section	
1.	Protection from cruelty and inhuman treatment	The appropriate Government shall take measures to protect persons with disabilities from being subjected to torture, cruel, inhuman, or degrading treatment.
2.	Protection from abuse, violence and exploitation	The appropriate Government shall take measures to protect persons with disabilities from all forms of abuse, violence, and exploitation.
3.	Protection and safety	Persons with disabilities shall have equal protection and safety in situations of risk, armed conflict, humanitarian emergencies, and natural disasters.

Table 3. Chapter 2: Rights and Entitlements, RPwD Act 2016

Source: The Rights of Persons with Disabilities Act, 2016, 2016

One of the most important agendas of the Smart Cities Mission, as mentioned in the Harmonised Guidelines & Standards For Universal Accessibility in India 2021, is the safety and security of individuals apart from affordable housing, efficient urban mobility and public transport (Government of India Ministry of Housing and Urban Affairs (MoHUA), Union Department of Public Works, 2022).

4.2. Crime Prevention Through Environmental Design

The course of designing security as a part of a built environment is recognized as "Crime Prevention Through Environmental Design" (CPTED). It involves suitable design interventions in the built environment to reduce the opportunity for, and fear of, predacious crime against any individual. CPTED takes advantage of opportunities for natural access control, surveillance, and territorial reinforcement (Building Resilience: Crime Prevention Through Environmental Design | WBDG - Whole Building Design Guide, 2018). This process is beyond the use of locks, gates and alarms to secure buildings. CPTED strategies are implemented through an overlap between three methods, as shown in Fig 3. (Atlas, 2013).

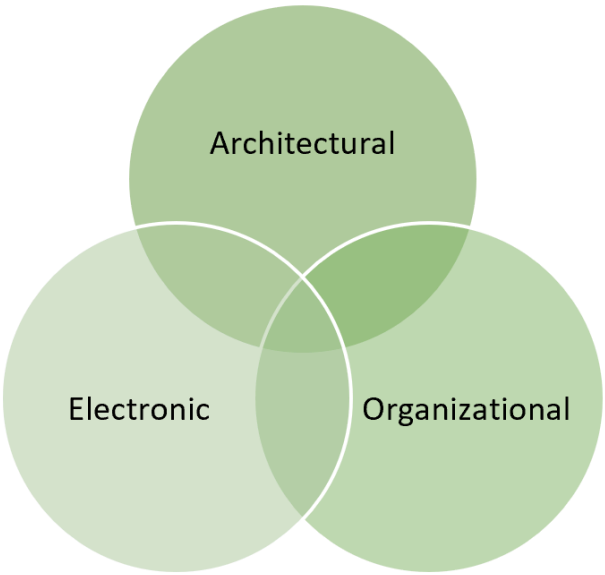

Fig.3. CPTED Strategies

Source: Randall I. Atlas

With the upcoming use of assistive technology for the comfort of individuals with disabilities and an up rise in the use of Building Automation Systems (BAS) globally, the marriage of architecture and electronics in this context is a suitable one. Further, any human-centric design requires a human touch, where organizational strategies come into the foreground- security guards and police being the key role players.

The applicability of CPTED is beyond essential in the case of public buildings, especially in schools, transit hubs, and office buildings.

a. CPTED involves certain concepts for the fulfillment of a secure architectural design; the following is the list of the same.
b. *Natural Surveillance:* This is an observational intervention wherein the provision of legitimate eyes on users of space keeps them in check. The ultimate goal should be to increase the population density in areas that are more prone to crime.
c. *Natural Access Control:* This concept dwells on the idea of boundaries, where access beyond a certain point is controlled; this may be through doors, fences, or shrubs. Psychological barriers may also play a crucial role in access control, with the help of signages, nature strips or directional pathways.
d. *Territorial Reinforcement:* Territorial control is essential to keep intruders at bay, and this may be achieved by expressing spatial ownership. A sense of belonging among users keeps them safe and helps them extend a sphere of influence against imposters.
e. *Maintenance and Management:* The physical image of an area may contribute to a major extent to its level of security, and this can be achieved mainly through the maintenance and management of pre-existing safety systems.

4.3. Effect of the Built Environment on Neurodiverse Individuals

A lot of research at the global level has been conducted on CPTED as a subject. Further, there is even less research on the cause of individuals with disabilities, especially Autism, and their fears as well as feelings (Rose, 2021).

The built environment plays a crucial role in establishing a sense of security among individuals with Autism, but also instilling it in real-time. However, the reverse is also true. An unfavourable environment is adequate to disorient an individual with Autism, followed by increased crime in the picture. Thus, a sense of fear is easily generated in their minds.

5. Materials and Methods

The architecture and design of a building often depend on the presence of risk factors concerning the various, homogenous population experiencing the environment (Kazdin et al., 1997). A risk factor, as also noted earlier, is “a characteristic, experience, or event that, if present, is associated with an increase in the probability (risk) of a particular outcome over the base rate of the outcome in general (unexposed) population” (Kraemer et al., 1997).

The method of research includes an overview of case examples in the form of secondary research (mainly from Australia) of environments where the role of CPTED has proven to be effective in the reduction of crime against individuals with Autism. The information gathered from the case studies has been translated into a table to

accommodate recommendations specific to neurodiversity. Australia has advanced as a country in this field, and thus, case examples from there are suitable for this study.

5.1. Case Studies

5.1.1. Logan Central, Logan City (Queensland, Australia)

A study was conducted called "Urban Jungles Project" by Queensland University of Technology (QUT), partnered with Logan City Council (LCC), Queensland Health and the Queensland Police, to answer a very basic question: *What prevents public urban spaces from being inclusive of everybody?*

The answer will be the guiding light to understanding the inter-relationships between the public realm and people experiencing neurodiversity (Guaralda et al., n.d.).

A series of examinations and documentation in the form of site study and mapping was conducted to find data relevant to understand the appropriate methodology applied to record the extent of inclusivity of an area and the security measures crucial for the same. Great importance was laid on the role of the same on neurodiversity.

The following are the steps included:

a. The study aimed at examining the public space system around Logan Central while mapping the area's sensory triggers against the existing navigational routes.
b. This exercise was followed by a survey of all the activities and events that brought the people of the community together during the latter part of the year.
c. An assessment of the physical state of the region is the first step in another mapping investigation. While performing the site tour, three observable conditions were mapped: physical damage to structures; excessive ground litter; and specific locations where he saw anti-social activities (Guaralda et al., n.d.).

This research brings forth the understanding that some contextual settings may prove to be difficult to comprehend and hence navigate through, as certain sensory triggers may be absent or uncontrollable. This can hurt individuals that are unable to filter out environmental inputs.

Following are a few points that can be considered from the perspective of CPTED in the case of Logan Central:

- The original principles of CPTED have been employed by the Logan Central Council, yet there is an absence of sensorial inputs such as proper lighting acoustics to help orient the individuals (Guaralda et al., n.d.).
- Each of us has sensory preferences (Carvill, 2001); hence there is a need to zone areas using sensory profiling.
- It is imperative to interpret the sensory information received through cognition, perception and orientation; that is where environmental cues such as colour-coded signage (not just signage) and the use of texture come into play (Lane et al., 2009).

Thus, through a unique methodology, the built environment can be read, and various sensorial applications can be incorporated to induce an enhanced experience for all users.

5.1.2. Perth Metropolitan Schools (Western Australia)

Crime in the form of bullying has taken centre stage in building design. Hence this particular study was done to record how bullying is exhibited as an ill-behaviour due to elements of the built environment in schools located in Perth, Australia.

The research methodology included interviews and surveys, online and face-to-face, using semi-structured guides of the school staff, students, and parents (Francis et al., 2022)

The following built environment factors are linked to bullying school buildings:

- Visibility and Supervision

Visibility and supervision included lighting and windows, crowding, and school size and security cameras as sub-factors. Proper lighting plays an important role in timely intervention in situations of bullying. Further, the idea of supervision instilled a sense of fear in the minds of the oppressors. Crowded areas were considered negative spaces in this research due to limited supervision.

- Physical and Psychological Comfort and Safety

Ventilation and temperature, acoustics and noise, queues, aesthetics, vandalism, and maintenance, along with furniture and seating, were considered the major components of the physical and physiological comfort and security factors in the school premises. Transition spaces such as corridors and staircases were identified as harassment zones due to the slow movement of the users. Many people also felt that neurodiverse students might struggle with the poor allocation of seats.

- Social-Emotional Competencies

This factor concentrated on elements affecting bullying through the social and emotional abilities of individuals and their implications on the victims.

Lighting and crowding were equated to visibility and comfort by the participants. The study concluded with the establishment of the need for advanced research for neurodiverse victims of bullying and other such crimes, especially in schools (Australian Institute of Health and Welfare, Australian Government, 2021).

6. Results

The study looked into the application of CPTED strategies in the public spaces and schools of Australia and translated the existing strategies into those suitable for neurodiversity (in the form of recommendations). The case studies provided insight into the different parameters useful in designing secure and mainly inclusive spaces for diversity in

age, class, gender, and abilities. The following table (Table 4.) is a cumulative pool of the built environment parameters that can be derived from the case studies.

Case Study	Suggested Parameters	Elements of Design
Logan Central, Logan City (Queensland, Australia)	1. Orientation 2. Customizable Zones 3. Cognition and Wayfinding	• Proper lighting and acoustics • Spatial configuration and sensory profiling of space • Colour-coded signages, texture
Perth Metropolitan Schools (Western Australia)	1. Visibility and Supervision 2. Physical and Psychological Comfort and Safety 3. Social-Emotional Competencies	• Appropriate spatial configuration and proper lighting • Thermal comfort, acoustics, aesthetics and maintenance • Sensory profiling of space and quiet zones

Table 4. Suggested Design Parameters from Case Studies

Source: Author

This information can be converted into direct recommendations for the application of the concepts for CPTED to cater to the neurodiverse inhabitants of the place. The table given below (Table 5.) showcases how the elements of CPTED can be tweaked and made comprehensive not only for architects and planners but also for the user of the space. A combination of physical, cognitive, and sensorial elements needs to be applied to create an inclusive environment in the truest sense. This can only be achieved if all the user profiles are taken into account.

In India, the Harmonised Guidelines & Standards for Universal Accessibility in India 2021 are a steppingstone in this direction. As it has been established that individuals with a disability are more prone to abuse and crime, the curbing of these negative activities in societies is extremely crucial. However, the placement of CCTV cameras and automated access controls is not enough; constant monitoring and maintenance are even more essential. Small children and the elderly should be taken into account while designing any typology of building as they may not be disabled but require more attention. The security of women should be taken into account at every step.

CPTED Concept	Applications	Recommendation for Neurodiverse Individuals (ASD)
Natural Surveillance	• Reinforcing Activity Generators • Design for Programming Activity Mix	• Fluid Transition Spaces • Connected Spaces • Appropriate Lighting and Acoustics
Natural Access Control	• Formal Surveillance at Access Points	• Signage and Maps • Colour-coded Areas and Pathways • Use of Landmarks
Territorial Reinforcement	• Ownership Signages • Localized Area Management	• Zoned Areas according to Sensory Profiles • Functional Isolation (Quiet spaces)
Maintenance and Management	• Reporting Maintenance • Vandal-resistant material use	• Sensory Sensitive material use • Regular Maintenance Overview

Table 5. CPTED Recommendations for Neurodiversity

Source: Author

The case examples taken from Australia are also a work in progress in this domain as continuous research is taking place as technology is changing; along with this, the nature of crime is also changing, which is the cause of concern, hence optimal environmental design is an important driver in building security and safety.

7. Conclusion

Crime Prevention through Environment Design is a very sought-after field of research, especially with the growing population of differently-abled individuals. It plays a pivotal role in creating a holistic and universal environment, which is human-centric at the core. The research has been focused on Australia as it is a continent incorporating CPTED in the design decisions for the inhabiting neurodiverse population. Many other countries, including India, are moving in this direction. However, stringent measures are the need of the hour. Individuals that belong to the neurodiversity umbrella, such as Autism, already have a lot on their plate, and becoming victims of society-inflicted crimes simply adds to their melancholy. Thus, it is not only crucial but necessary to incorporate methods to prevent crime and create a secure environment for them. The parameters suggested in this research are only the tip of the

iceberg, and many solutions can be integrated into the built environment design process. It is central to be mindful right at the beginning of the concept stage, as the safety and security of Individuals cannot be an afterthought. Lastly, as suggested through this research, safety is not a luxury but a human right for existence in this world and should be achieved at all costs.

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Conflicts of Interest

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