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TRANSFORMATION OF BEHAVIORAL ARCHITECTURE: SPATIAL AND PSYCHOLOGICAL STRATEGIES IN DESIGNING A SOCIAL CENTER FOR STREET CHILDREN IN MEDAN CITY

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ABSTRACT

The urban development of Medan, Indonesia, reflects a growing social challenge related to the presence of street children living in vulnerable conditions. Official data from the Social Service of North Sumatra indicate that there are approximately 525 street children. Current social facilities often adopt a warehousing model, referring to large scale, institutionalized mass shelter systems that tend to neglect the psychological needs of users. This is particularly concerning given that 92% of street children suffer from profound trauma. This study proposes a Trauma-Informed Healing Architecture (TIHA) framework for a Social Center in Medan Selayang. By synthesizing Irwin Altman's Territoriality and J. Douglas Porteous's "Meaning of Home," the research identifies spatial strategies to mitigate triggers and foster recovery. Methodologically, a qualitative descriptive approach is used to analyze local demographic data against global benchmarks. Key findings suggest that circular massing for passive surveillance, zonal acoustic buffering to counter traffic noise, and the provision of primary territories significantly reduce aggression. The resulting design integrates neo-vernacular stilt architecture to address urban flooding while restoring the dignity and agency of marginalized youth.

Keywords: *behavioral architecture; Medan; street children; territoriality; trauma-informed design*

1. INTRODUCTION

The rapid urban expansion of Medan, Indonesia's third-largest metropolitan area, has generated economic growth while simultaneously intensifying social marginalization. One of the most vulnerable groups affected by this paradox is street children and homeless youth, whose presence reflects systemic failures in social protection, family stability, and equitable urban development. Data from the Social Service of North Sumatra indicate that there are approximately 525 street children, consisting of 436 boys and 89 girls. Many of these children experience layered vulnerabilities, including economic exploitation and sexual exploitation, often exacerbated by family fragmentation and the absence of parental support.

Beyond economic deprivation, psychological trauma represents the most severe and persistent challenge faced by street children in Medan. According to Siregar et al. (2024), citing the Center for Child Protection Studies (2023), 92% of street children suffer from profound trauma, manifesting in hypervigilance, aggression, withdrawal, and impaired social trust. These conditions are continuously reinforced by the urban environment, which exposes children to chronic noise, pollution, overcrowding, and violence. Consequently, the built environment plays a critical role not only in shaping daily behavior but also in influencing emotional regulation and long-term recovery.

Despite this reality, conventional architectural responses to street children in Indonesia have largely focused on basic shelter provision, often adopting institutional or correctional typologies. Such facilities tend to emphasize control, efficiency, and capacity through a "warehousing" model, while neglecting psychological safety, personal autonomy, and a sense of belonging. Rather than facilitating healing, these environments risk reproducing conditions of confinement and surveillance that may retraumatize already vulnerable children.

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This disconnect highlights a significant gap between architectural practice and the behavioral and emotional needs of marginalized youth.

This study addresses that gap by positioning architecture as an active agent of social healing through a Trauma-Informed Healing Architecture (TIHA) framework. By synthesizing Irwin Altman's theory of territoriality and J. Douglas Porteous's concept of the "Meaning of Home," the research proposes spatial strategies tailored to the urban and cultural context of Medan, specifically for a Social Center in Medan Selayang.

The Data collection was conducted through secondary data review, archival research, and field-based spatial observation. Secondary data were obtained from government reports, NGO publications, and peer-reviewed literature addressing street children, trauma psychology, and environmental behavior design (Altman, 1975) and (Porteous, 1976). Archival materials such as maps, photographs, and planning documents were used to support spatial analysis and precedent studies (Groat and Wang, 2013). Field observations in Medan Selayang focused on identifying environmental stressors, including noise exposure, spatial conflict, and accessibility, using purposive sampling based on relevance to the research objectives.

2. METHODS

2.1 Data Collection

Data were analyzed using thematic analysis, comparative case study analysis, and spatial-behavioral analysis. Psychological and architectural literature was thematically coded to extract key concepts related to territoriality, sense of home, and trauma-informed design (Altman, 1975) and (Perkins&Will, 2019). Comparative analysis of selected international precedents was conducted to identify transferable spatial strategies for rehabilitation environments [8]. The analytical outcomes were synthesized into architectural design criteria informing zoning, massing, and sensory regulation strategies.

2.2 Data Analysis

The collected data were analyzed using thematic analysis, comparative case study analysis, and spatial-behavioral analysis. Psychological and architectural literature were thematically coded to extract core concepts related to territoriality, sense of home, and trauma-informed design (Altman, 1975) and (Perkins&Will, 2019). Furthermore, comparative analysis of selected international precedents was conducted to identify transferable spatial strategies for rehabilitation environments (Yin, 2017) . The findings were then synthesized into architectural design criteria, informing zoning, massing, and sensory regulation strategies.

3. RESULTS AND DISCUSSION

The findings reveal a significant discrepancy between the child's needs and current institutional designs. Vulnerable youth in Medan live in a state of hypervigilance due to exposure to chronic noise, pollution, and violence.

Tabel 1. Statistics and Characteristics of Street Children in Medan (2023)

No	Statistics Category	Data / Percentage	Behavioral Implications
1	Total Recorded (Official)	525 children (436 boys, 89 girls) *(BRIDA, 2023)*	Need for inclusive, gender-responsive shelters and outreach systems.
2	Field Estimate	324 children *(Social Service data)*	Indicates urgency for protection-oriented intervention and rehabilitation spaces.
3	Economic Exploitation	65%	Need for visible vocational workshops to build agency.
4	Sexual Exploitation	15%	Absolute requirement for gender-segregated zones.
5	Psychological Trauma	92%	Environment must act as a sensory regulator.
6	Educational Attrition	45% (Primary School)	Integration of non-formal, intuitive learning.

3.1. Theoretical Synthesis: Territoriality and Home

Irwin Altman's theory of territoriality emphasizes that "primary territories" spaces that are perceived as private, controlled, and personally owned, play a crucial role in supporting psychological stability and emotional recovery. In the context of vulnerable populations, particularly street children who often

experience instability and lack of personal space, the absence of such territories can lead to heightened stress, defensive behaviors, and aggression.

In the proposed Social Center design, this concept is translated into architectural strategies such as the provision of private sleeping areas, lockable personal storage, and clearly defined personal zones within shared environments. These elements aim to foster a sense of ownership, autonomy, and safety, which are essential for emotional regulation and long-term rehabilitation.

Complementing Altman's theory, Porteous's "Meaning of Home" framework provides a more holistic understanding of how spatial environments contribute to human well-being. This framework identifies six key dimensions that are highly relevant in shaping the design of a therapeutic and supportive environment:

1. **Haven:** The facility is designed as a protective refuge from the chaotic and often unsafe urban environment of Medan. This is achieved through spatial buffering strategies, including inward-oriented layouts, controlled access points, and the strategic use of vegetation and building massing to reduce noise and visual disturbances. In this context, the inward-oriented layout is reinforced through a circular massing configuration, where building volumes are arranged to enclose a central courtyard. This spatial formation physically and visually directs activities toward the interior, minimizing exposure to external stressors while enhancing a sense of enclosure and control. The circular arrangement also strengthens passive supervision and creates a cohesive, community-centered environment. Ultimately, this integrated approach aims to establish a calm, secure setting that supports psychological safety and emotional recovery.
2. **Order:** A clear and predictable spatial organization is essential in reducing anxiety and building trust among users. The design incorporates logical zoning, intuitive circulation paths, and consistent spatial hierarchies. This allows children to easily understand and navigate their environment, minimizing confusion and fostering independence.
3. **Identity:** The design encourages personalization and self-expression, which are critical for rebuilding self-esteem and identity among street children. Opportunities for personalization include designated display areas, customizable sleeping spaces, and the use of nameplates or artwork. These elements help transform the space from an institutional facility into a place that feels personally meaningful.
4. **Connectedness:** Social interaction is facilitated through shared communal spaces, such as *wisma* (group housing units), lounges, and activity areas. These spaces are designed to encourage informal interaction, peer support, and the development of social bonds, which are essential for emotional healing and social reintegration.
5. **Warmth:** The use of natural materials such as wood, exposed brick, and warm-toned finishes helps create a welcoming and non-institutional atmosphere. This contrasts with the cold and rigid aesthetic often associated with institutional buildings, thereby enhancing emotional comfort and reducing feelings of alienation.
6. **Physical Suitability:** Spaces are designed to be flexible and multifunctional, accommodating a range of activities including play, education, therapy, and vocational training. This adaptability ensures that the environment can support diverse needs and developmental stages of the children.

3.2. Trauma-Informed Design (TID) Principles

The TIHA framework integrates 5 core principles of trauma-informed architecture to support recovery [5].

Tabel 2. Trauma-Informed Healing Architecture (TIHA) Spatial Intervention Matrix

No	Environmental Factor	Behavioral Trigger	TID Mitigation Strategy
(1)	Lighting	Dark Corners	Maximized Daylighting: Use of clerestory windows and skylights. Circadian Lighting: Indirect LEDs that mimic natural light cycles to help regulate sleep patterns disrupted by street life.
(2)	Wayfinding	Disorientation / Confusion	Intuitive Navigation: Eliminating dead-end corridors. Using Visual Landmarks (like a central tree or a unique mural) to help children navigate without needing complex signage.
(3)	Acoustics	Slamming doors / Echoing halls	Sound Attenuation: Implementing acoustic ceiling baffles and wood-cladding. Zoning: Separating

			high-energy "noisy" zones (playgrounds) from "quiet" zones (counseling/rest).
(4)	Visibility	Fear of unseen threats	Passive Supervision: Open floor plans and glass inserts in doors allow staff to monitor safety without being intrusive, and allow children to see their surroundings clearly.
(5)	Fittings	Institutional / Hostile fixtures	Domestic Scale: Using residential-style furniture with curved edges and soft fabrics to provide tactile comfort and a sense of safety.

3.3. Case Study Comparison and Benchmarking

Analysis of international projects demonstrates successful implementation of these behavioral principles:

1. **Tsukuba-Aiji-En (Japan):** This facility utilizes an oval corridor design. This eliminates "blind corners," ensuring that children never feel cornered and that staff can maintain a 360-degree view of the facility passively. The heavy use of cedar wood provides a scent and texture that promotes emotional regulation.
2. **SOS Children's Village (Djibouti):** This project adopts a Medina typology, referring to a traditional urban form characterized by clustered buildings, narrow pedestrian alleys, and shaded pathways that promote privacy and climatic comfort. In this context, the arrangement creates quiet, enclosed circulation spaces that enhance a sense of safety. Additionally, the use of wind catcher towers supports natural ventilation, demonstrating how vernacular environmental strategies can create a protective and comfortable microclimate.
3. **Enabling Village (Singapore):** This project demonstrates the application of universal design principles by integrating the facility with the surrounding community. Public-facing amenities, such as cafés and shared spaces, encourage social interaction and inclusivity. This approach ensures that users are not isolated but are instead gradually reintegrated into society in a controlled and dignified manner.

4. CONCLUSION

This study concludes that the shift from warehousing models characterized by large and impersonal dormitories toward therapeutic environments is essential for supporting the rehabilitation and well-being of street children. The findings demonstrate that the integration of Trauma Informed Healing Architecture (TIHA) principles, combined with Altman's concept of territoriality and Porteous' notion of the meaning of home, can be effectively translated into spatial design strategies for a social center in Medan Selayang.

Furthermore, the incorporation of local Neo Vernacular elements, such as the North Sumatran stilt house *Rumah Panggung*, enhances environmental responsiveness through improved ventilation and flood resilience, while also reinforcing cultural familiarity and a sense of belonging. As a result, the proposed design framework not only addresses physical needs but also supports psychological recovery and the restoration of dignity among street children.

Overall, the research objective has been achieved through the development of a comprehensive architectural framework that integrates behavioral, cultural, and environmental considerations into a trauma responsive design approach. Future research may explore the integration of sensory modulation spaces to further support emotional self regulation.

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