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# Integrating Spatial Psychology in Juvenile Rehabilitation Center Design

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**Abstract**
This research explores the integration of spatial psychology in the architectural design of juvenile detention centers, with a focus on fostering rehabilitation rather than retribution. Drawing from environmental psychology, neuroscience, and architectural theory, the study examines how thoughtfully designed spaces can influence behavior, emotional well-being, and identity formation in incarcerated youth. The case study of the Bon Air Juvenile Correctional Centre (BAJCC) in Virginia provides a practical example of design strategies that support therapeutic outcomes—such as small-scale housing units, biophilic elements, purpose-driven zoning, and normalized communal areas. By analyzing existing literature and real-world applications, the paper proposes a design framework that aligns with trauma-informed care and developmental psychology and demonstrates that architecture, when informed by spatial psychology, can act as a silent partner in the rehabilitation process, fostering safety, agency, and personal growth for juveniles in custody.

**Keywords:** Spatial Psychology, Juvenile Rehabilitation, Therapeutic Architecture, Correctional Facility Design

## 1. INTRODUCTION

Juvenile rehabilitation requires adequate attention as the offenders need to be reintegrated into the society. Therefore, designing rehabilitation centers focusing on holistic development of juveniles, to foster positive psychology on them is the need of the hour.

The aim of this research is to employ the effects of spatial psychology on humans to develop an optimal design strategy for a rehabilitation facility for juvenile delinquents. The objectives of this research are to identify key architectural elements that promote emotional healing and behavioral reform and to assess the effectiveness of spatial interventions in reducing recidivism and enhancing reintegration. Analyzing the impact of spatial psychology on juvenile behavior; to explore the role of therapeutic and biophilic design in rehabilitation centers and to develop a design framework integrating psychology and architecture for juvenile rehabilitation.

This study explores the role of spatial psychology in rehabilitation, focusing on how architectural and environmental design principles influence behavioral and psychological outcomes in rehabilitative settings. It examines key design strategies that foster healing, security, and personal growth, such as natural light integration, open space planning, biophilic elements, and therapeutic color schemes. A detailed behavioral and psychological impact analysis will assess how spatial arrangements affect mood, stress levels, and social interactions, ultimately shaping rehabilitation outcomes. To support these insights,

the study will incorporate case studies and best practices from successful juvenile detention centers and rehabilitation facilities worldwide, highlighting innovative architectural approaches that promote psychological well-being and reintegration into society. For the purpose of primary case study, there is limited access to Juvenile rehabilitation facilities, thus this research is based on secondary case studies. The variation of socio-cultural and regional aspects come into play while looking into such institutions as the success of any design is context specific. The design framework needs to abide by the legal and administrative frameworks of the locality, also it will be restricted by practical possibilities and financial aspects.

## 2. Spatial Psychology

Spatial psychology is the study of how built environments—particularly spatial arrangements, proportions, and features impact human behavior, cognition, emotions, and social interaction. It delves into how people perceive, traverse, and emotionally respond to the spaces they occupy, and how these responses influence mental well-being, productivity, and interpersonal dynamics. (Sternberg & Wilson, 2006)

The relevance of spatial psychology in designing rehabilitative spaces such as juvenile criminal detention centres is extensive, as the built environment shapes human behavior and emotional well-being, influences perception, cognition and mood. Spaces that are designed thoughtfully can reduce stress, improve focus, foster social interaction, and accelerate emotional healing. It has been proved that environments with natural light, open layouts and soothing colors promote calmness and reduce anxiety. On the other hand, spaces that are cramped or overly sterile spaces can lead to discomfort and psychological distress. As (Sternberg & Wilson, 2006) emphasize, “architecture influences the brain’s neurobiological response to space,” underscoring the necessity of integrating psychological principles into spatial design to support healthier, more responsive environments.

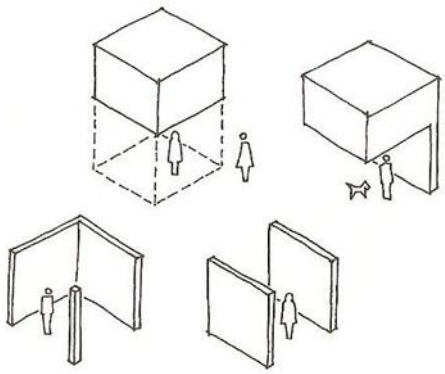

**Figure 1 Spatial Layout**

Research shows that architectural shapes can provoke different emotional responses. For instance, spaces that include curves or intricate designs are linked to heightened levels of arousal. This implies that using these forms in design can boost engagement and invigorate those who inhabit the space. (Emmanouil Xylakis, 2021)

The layout of architectural environments plays a crucial role in shaping human psychology, impacting feelings, thought processes, and general wellness. Studies in this interdisciplinary area investigate how factors like shape, illumination, and spatial arrangement affect human experiences. This is an important

consideration when designing for rehabilitation purposes as we need to analyze the psychological aspects of spaces to create a space fostering positive environment.

## 3. Architecture form and emotional response

The spatial arrangement of elements evokes several emotional responses depending on the configuration of those elements. An empty white room with no openings will develop feelings of isolation in humans and one can't stay in such space for long as their mental health will deteriorate drastically. Similarly, if a child is alone in a huge space, he will start crying eventually as he'll ergonomically not fit in the space which will make him feel alienated and his emotional response will be drastic.

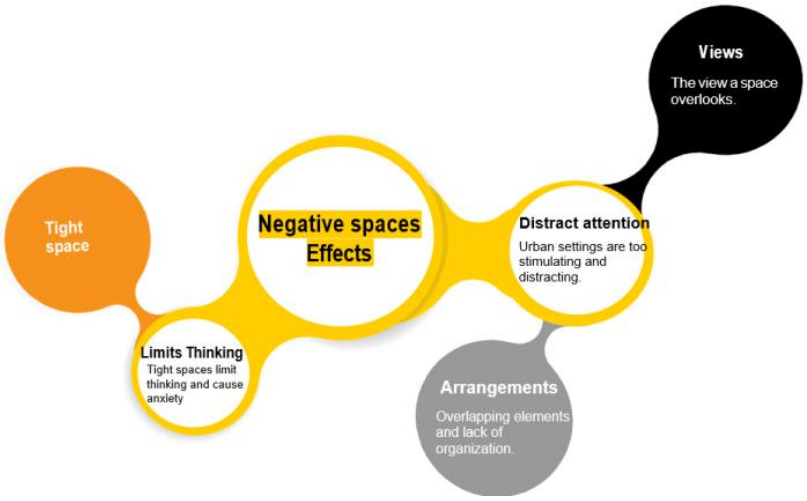


**Figure 2 Impact of spaces on mental health**

Research shows that architectural shapes can provoke different emotional responses. For instance, spaces that include curves or intricate designs are linked to heightened levels of arousal. This implies that using these forms in design can boost engagement and invigorate those who inhabit the space. (Emmanouil Xylakis, 2021)

Therefore, how humans interact with spaces around them must do a lot with the alignment, arrangement and configuration of that space and hence considering this factor to facilitate rehabilitation is necessary since the way prisoners will respond to their surrounding depends on the surrounding itself. Providing a space that is secured, yet not avails a feeling of oppression is necessary to part rehabilitation.

## 4. Lighting and cognitive function

Proper lighting in architectural environments is vital for cognitive function and emotional well-being. Studies leveraging virtual reality and EEG assessments have shown that changes in natural light intensity in workspace environments can substantially affect architectural perceptions. Ideal lighting situations are associated with enhanced cognitive involvement and uplifting emotional experiences. (Emmanouil Xylakis, 2021)

Illumination and acoustics of any space can moderate human behavior in a way that is important to consider when designing for rehabilitation. If the cells are too dimly lit, it might hamper the perception of day and night for the inmate, significantly depreciating their mental health, and in turn lead to fuel their criminal psychology further.

When designing space for rehabilitation purposes, we as architects need to consider the optimal

daylighting so as to impart a chance of improvement of the mental health of criminals, in order to reduce recidivism rates.

## 5. Restorative environments

It has been demonstrated that exposure to restorative environments—which are defined by natural elements and carefully planned spatial arrangements—activates brain correlates linked to wellbeing and relaxation. Studies using functional magnetic resonance imaging (fMRI) show that these kinds of settings can have a favorable impact on brain areas associated with stress reduction, underscoring the therapeutic potential of biophilic design concepts. (Juan Luis Higuera-Trujillo, 2021)

**Table 1 Effects generated by variables or aspects of architectural design frequently studied in the environmental psychology and EBD approach.**

| Design Variable | Effect |
|---|---|
| Presence of vegetation | • Vegetation reduces stress and anxiety<br>• In parks, pleasure increases based on tree density, and arousal with weed density<br>• Biophilia hypothesis: preference for natural forms<br>• Attention restoration theory: natural environments are restorative. Their restorative characteristics are "fascination," "being away," "coherence," and "compatibility" |
| Complexity | • Preference for moderate levels of complexity, similar to a savannah environment<br>• Prospect-refuge: preference for natural and built environments, which offer visual control of the environment and places to hide |
| Illumination | • Color temperature and illuminance are interrelated with comfort<br>• Natural light reduces hospital stays<br>• Light and form are interrelated: walls and ceilings influence the perception of brightness. A room appears larger when it receives more indirect light<br>• Mood valence and cognitive performance alter based on light parameters: colour temperature with a less negative effect on mood, improved cognitive performance, the combination of colour temperature, and illuminance with better evaluation in mood, improved cognitive performance<br>• Emotional states affect the perception of brightness |
| Color | • Extracted at an early stage of visual processing<br>• Wide variety of effects on aesthetic preferences<br>• Hue and saturation are related to the emotional state<br>• Warm tones have higher arousal values, and colder tones are lower |

| Design Variable | Effect |
|---|---|
| Use | The use to which a space is put influences its psychological evaluation |
| Ceiling height | • High ceilings inspire freedom, low ceilings calm<br>• High ceilings generate greater creativity and feelings of comfort<br>• Ceiling height positively affects wayfinding |
| Coherence | In natural settings, the coherence of a setting with wooden furniture is significantly greater than a setting with metal furniture, but significantly less than a setting without furniture |

## 6. Elements impacting rehabilitation

The architectural design of correctional facilities plays a pivotal role in the rehabilitation of inmates, influencing their psychological well-being and prospects for reintegration into society. As discussed in the previous section, architectural elements affect mental health as it form the environment one resides in. Therefore, to impart rehabilitation in criminals it is important to consider the architectural elements and spatial arrangement.

### 6.1.Space Layout and Design

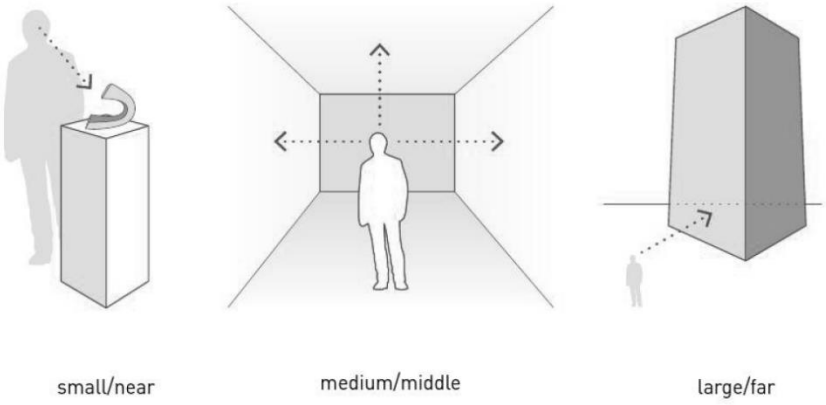


**Figure 3 Humans interaction with architectural spaces**

- Open and Flexible spaces - Designs that incorporate open and adaptable areas can reduce feelings of confinement and promote positive social interactions among inmates. Such environments are associated with improved mental health and reduced aggression. (Roland Karthaus and Lucy Block, 2019)
- Privacy Consideration - Even in a custodial environment, giving people privacy and personal space can improve their sense of dignity and self-worth, which can aid in their rehabilitation. (Ginneken, 2022)

### 6.2. Access to natural light and nature

- Natural light exposure has been associated with better mental and emotional well-being. The psychological well-being of prisoners can be improved by architectural designs that optimize natural lighting. (Anon., 2019)

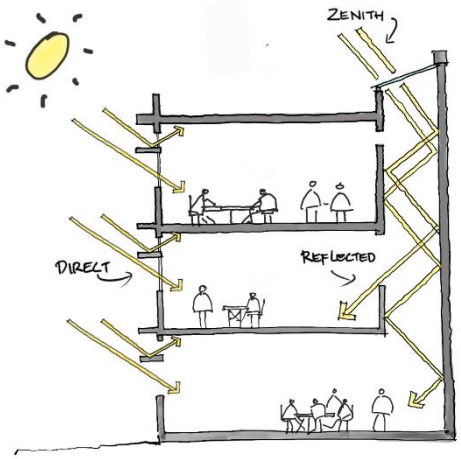


**Figure 4 Lighting in spaces**

- Incorporation of green spaces within prison environments can provide therapeutic benefits, reduce stress and promotes rehabilitation.

### 6.3. Material and color usage

- Soothing color palettes - A more peaceful atmosphere can be produced by using soothing colors in interior design, which may lessen prisoners' tension and aggressive tendencies. (Mercurio, n.d.)
- Natural materials - Incorporating natural materials, such as wood, can create a warmer and more humane atmosphere, which may support rehabilitative efforts. (Mercurio, n.d.)

## 7. Case Study – Bon Air Juvenile Correctional Center, Virginia

The Bon Air Juvenile Correctional Center (BAJCC) in Virginia exemplifies how spatial psychology can be purposefully incorporated into the design of correctional facilities to foster rehabilitation rather than punishment. Being Virginia's only state-run juvenile detention facility since 2017, BAJCC has played a key role in the state's initiatives to use therapeutic and rehabilitative methods to reform juvenile justice. (Anon., 2024)

**Figure 5 Bon Air Juvenile Correctional Center**

As termed by Mackenzie Seward in her thesis as a “concrete maze”, this juvenile correctional facility is

huge with gigantic gates and one can find themselves in an environment that is made up majorly of concrete and steel. The high security and surveillance is evident as she describes her visit to the centre; where she had to cross several checkpoints before reaching the units. (Seward, 2023)

The setup of this facility can be understood by the statement by Reverend Ashley Diaz Mejias stating, "The setup of the prison is really similar to a high-level adult facility. It has kind of the spider setup. You see only concrete walls, the basketball courts are completely enclosed." (Manzanares, 2022)

Although initially standing as a punitive facility, there have been renovations proposed to transform it to create more therapeutic and human-centered environments. The institution is shifting towards a layout that is like educational facilities, with open and less restrictive spaces that focus to dignity and personal development. Purpose-driven educational, therapeutic, and career training facilities demonstrate faith in the young person's abilities and promote a feeling of worth and inclusion. (Knight, 2023)

Individual community style housing units are replacing traditional dormitories, encouraging stronger peer relationships, individualized care, and a sense of safety that are essentially the key elements in reducing institutional trauma and promoting self-regulation. (Day, 2002) (Sommer, 1969)

Architecture design elements like large windows that welcome natural light in, green courtyards providing a break from built-form and other biophilic touches are central to the new approach. These characteristics serve a psychological purpose as well as being aesthetically pleasing, since studies have shown that exposure to daylight and outdoors can lessen aggression, elevate mood, and promote general well-being. (Ulrich, 1984) Incorporation of social spaces for interaction such as common dining halls, multipurpose rooms and counselling areas promotes emotional development, while subtly integrated security measures provide safety without reinforcing a punitive atmosphere. Additionally, educational and job-readiness zones reflect an investment in cognitive and personal growth, reframing residents' identities from "offender" to "learner" or "apprentice". (Sternberg & Wilson, 2006) Through the application of spatial psychology concepts to architectural strategies, BAJCC establishes an atmosphere in which rehabilitation is not only feasible but expected.

## 8. Design Framework

The design framework that fosters optimal rehabilitation in Juvenile Detention Centers based on the spatial psychology study and case study of BAJCC is listed below-

- **Human-Centered Layout**: Design facilities to resemble educational campuses rather than prisons, with open, inviting, and flexible layouts will promote autonomy and reduce institutional stress.
- **Therapeutic Zoning**: Incorporate dedicated zones for learning, counselling, recreation, and reflection to support cognitive and emotional development.
- **Biophilic and Natural Design**: Maximize natural light, green views, and outdoor access to lower stress and aggression, following findings on nature's healing effects.
- **Small-Scale Housing Units**: Use home-like, low-capacity residential units to foster personal space, peer bonds, and trust with staff, reducing trauma.


**Figure 6**

- **Normalized Social Spaces**: Create communal areas (dining, lounges, group therapy rooms) to encourage healthy social interaction and emotional expression.
- **Discreet Safety Measures**: Integrate security features subtly (e.g., shatterproof transparent windows) to ensure safety without creating fear or shame.
- **Purpose-Driven Design**: Use architecture to reinforce identity transformation—from inmate to student or apprentice—through spaces that convey opportunity and growth.

This concept highlights that space is a rehabilitative instrument that shapes behavior, identity, and rehabilitation; it is not neutral.

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