

Potential of Architecture on Therapeutic Educational Spaces for School-Aged Children with Autism Spectrum Disorder in Sri Lanka

PT Wickramasinghe¹ and MLNH Premarathna¹

¹ Department of Architecture, Faculty of Built Environment and Spatial Sciences, Southern Campus, General Sir John Kotelawala Defence University, Sri Lanka

#34-barch-002@kdu.ac.lk

Abstract: Autism Spectrum Disorder (ASD) is a neurodevelopmental condition known by deficiencies in social communication and the expression of repetitive or/and unusual behaviours. The prevalence of ASD today is getting high while affecting a significant percentage of the population of Sri Lanka. Hence, implementing a processed institutionalizing plan of the condition could become more relevant presently.

This study explores the significance of applying specific spatial design approaches to accommodate mainstream and special education classrooms in the Sri Lankan educational context. Moreover, it seeks the awareness of Sri Lankan Architects on ASD and its association with spatial attributes in creating therapeutic learning environments for children with ASD in Sri Lanka.

Keywords: ASD, Autism, Spatial Healing, Therapeutic Educational Spaces, Autism-Friendly Architecture

1. Introduction

“Around 1 in 50 people are autistic. About 60% of autistic adults are under or unemployed. 87% of us have a mental illness. Autistic people are 9 times more likely than the general population to die by suicide. We have an average life expectancy of just 54 years. And we deserve better...” (Houting, 2019)

According to Research on 2016 by UNESCO recently, there is a sharp increase in the frequency of this autistic condition, specifically

in low and middle-income (LAMI) countries, such as Sri Lanka.

The challenge of designing spaces for children with ASD is that the two scenarios do not match due to their different symptoms. They are different sensitivities and different levels of functioning. On the meaning of words, these children have extraordinary reactions to the environment and may require a well-structured learning environment with clear boundaries for each activity. They need a comfortable distance between themselves and others.

Ideally, spaces ought to design individually to allow for individualized symptoms and to help individuals with ASD build a tolerance to environmental stimuli. Hence the schools need to facilitate the learning experience of child's individual requirements such as light, colours, scale and form, which are to be explored by this study.

A. Need for the study

Autism awareness is growing in Sri Lanka, but slowly. Whatever the case may be, it affects a significant percentage of citizens. As a part of awareness and acceptance of ASD, some institutions, programs, societies, and communities relate to the condition. But among these activities, architecture's contribution is much less mentioned but equally important as others in the process of institutionalization in the general context of Sri Lanka.

Thus, there are no well-defined special needs schools and inclusive schools for children with

ASD under well-defined written principles, theories, and guidelines about the environmental considerations under creating learning environments for school-aged children with ASD. Furthermore, there is a lack of research examining the impact of the built environment and architectural conditions on Children with ASD based on their psychological and physical needs in the Sri Lankan context.

B. Research Aim and Objectives

This study aims to explore the contribution of environmental psychologically-physically friendly Architecture to developing skills, emotions, and mental statements of children with ASD as a part of institutionalizing the Autism Spectrum Disorder in Sri Lankan Society.

The objectives of the study are to;

- Identifying possible architectural approaches and design parameters through the relevant architectural theories and practices for designing for ASD
- Identifying the benefits and challenges of designing autism-friendly therapeutic spaces from case studies
- Exploring the impact of architecture on autistic children and possible design strategies for designing an autism-friendly learning environment for ASD in the context of Sri Lanka

C. Literature Review

1) Understanding Autism Spectrum Disorders:

Up to 2% of the global population has ASD. The exact number is hard to pin down, but millions of people are affected worldwide.

Autism is a neurological disability that causes by an outstanding brain abnormality in a person. Even though autism can diagnose at any age and it defines as a developmental disorder because the symptoms usually appear within the first two years of life. Although it can be a lifelong disorder, treatments and services can improve a person's symptoms and ability to function. (Health, 2018).

There is a wide variation in the type and severity of symptoms people experience. The spectrum identifies disorders from mild to severe, including Asperger Syndrome, Atypical Autism or Pervasive Developmental Disorder not otherwise specified (PDD-NOS), Childhood Disintegrative Disorder, and Autism Syndrome; who have some degree of social skills, empathy, communication, and flexible behaviours issues.

D. Sensory Processing

Typically, people receive information about a space based on all of their senses as a group: smell, sight, taste, sound, and touch. This ability is known as sensory integration/ sensory processing and is needed to achieve a clear perception of a situation and to decide how to respond. But people with ASD have deficits in sensory processing, due to the incompetence to process information from several senses at once.

Individuals with ASD are particularly sensitive to the surrounding environment, primarily because of sensory processing deficits. For many, sensory processing deficits, such as sensitive eyesight or hearing, can make the built environment a distracting and even frightening place. (Gaines, et al., 2016)

An American Psychologist Carl H. Delacato defines a range of three different sensory processing capabilities: Hyper-sensitive, hypo-sensitive, and interference. Just as the symptoms of autism vary across a spectrum, these different characteristics of processing can be arranged on a spectrum.

Hyper Sensitivity – sensory overloaded: Children with hyper-sensitivity are more susceptible to sensory information received because they are more sensitive to their physical environment than interference.

Hypo Sensitivity – sensory-seeking: individuals often create or generate their own sensory experiences for pleasure or to block other unpleasant stimuli. They need to be sensory overwhelmed or have more sensory stimuli to successfully process sensitive information.

E. ASD in Sri Lanka:

A 2009 study found an autism prevalence of 1.07%, affecting 1 in 93 children between 18 and 24 months. As the study only used a small sample size and global autism numbers are rising, the prevalence still today might be higher in any case.

Many individuals make out with ASD live in less developed countries such as Sri Lanka, where services to meet their needs are inadequate or non-existent.

In 2017, the Enable Lanka Foundation published an Autism Toolkit adapted to the Sri Lankan context and translated into Sinhala. But, there are not sufficient information materials in Sinhala and Tamil to create awareness and overcome the social stigma associated with special needs and disabilities.

Also, there is a lack of other resources, such as the availability of specialists in rural areas. And these families need to be empowered and build their capacities to meet at least a few of their children's needs.

There is also a disturbing lack of facilities and opportunities for adults with Autism. ASD does not cure or stop affecting people with the rise of age. Therefore, safe living facilities and employment opportunities for adults with special needs ought to implement in the country. Moreover, there is a need to develop culturally appropriate and sensitive screening and diagnostic tools to assist with more sensitive and accurate diagnoses. (Muttiah, 2015)

F. Autism and architecture:

Architecture is responsible for making environments that include the needs of all types of people. The specific needs of people should not be an exception. Though autism has a high prevalence, the instructions for developed architectural implementations become special in autism needs. (araghi, 2014)

However, today, other disabilities are obviated by converting the built environment into "accessible". Dianne Smith (2009) claims such when referring to people with certain cognitive, sensorial deficiencies and many disabilities which we determine to be "less visible". Among these, we can find people with ASD, for whom

the supposition regarding how spaces are to be perceived and inhabited is far from a certainty and who, due to their deficits, sometimes have to make an enormous effort to be able to assimilate and understand the environment surrounding them, provoking a "blockage" as far as the composition of the surroundings is concerned, which in turn leads to a state of crisis.

Therefore, the architectural environment is a factor which directly affects those individuals with "less visible" deficiencies, as the architect John Jenkins confirms. (Humphreys, 2015)

In such theories, autistic behaviors are credited to a form of sensory malfunction when assimilating stimulatory information from the surrounding physical environment. It is the conceptual pivot of this research that the architect, through the design of this sensory environment, has control over the nature of this critical sensory input. By understanding the mechanisms of this disorder and consequent needs of the autistic user, this environment may design favorably to alter the sensory input and perhaps, modify the autistic behaviors, or at least create an environment conducive to skill development and learning. (Mostafa, 2008)

Architecture requires a filled physical interaction. Creating responsive, sensory environments like these—physical spaces that support increased mind-body connection, help develop skills, and expand social interaction—could be a powerful tool for dealing with ASD. (Mortice, 2016)

And the most important fact is that Architecture can address the needs of occupants with ASD. That is because buildings accommodate the needs of their occupants through spatial configuration, acoustics, lighting, temperature, air quality, furnishings and finishes. A common hypothesis in the literature is that modulating these features of the physical environment can help all occupants relax and focus. (Shell, et al., n.d.)

Architecture and interior spaces can be modified to positively influence the behavior individuals

with ASD often exhibit by modifying factors such as colour, texture, sense of closure, orientation, acoustics, ventilation, etc. (Mostafa, 2008)

G. Designing the Learning Environments for Children with ASD

Autism is not a “one size fits all” disorder; each boy and girl is different. It emphasizes that no two children with ASD have identical educational needs. (SDCAadmin, 2020)

But, in a recent survey conducted by Tech Learning (2015), “92% of teachers believe classroom design has an impact on student learning.” These teachers believe there is a direct link between classroom design and student performance and engagement. And the importance of designing schools where all students can achieve their highest level of potential despite any physical or mental limitations. (Architecture, n.d.)

H. Given guidelines and design approaches

Many architects professionally work for autism and do research related to providing guidelines for architectural spaces for autism-friendly learning environments.

Here are some significant studies where a scientific method of investigation seeking to analyze the architectural impact on autistic behaviors through the development of quantitative numerical data is employed.

1. In the studies by an Arch. Magda Mostafa in 2008,
 - Soundproof spaces for speech practices give 'promising indications' of attention span, response time and behavioral character.
 - Compartmentalized space creates 'separate defined zones' to help reduce distraction and improve productivity.
 - Use of sensory zoning on behalf of functional zoning.
 - The use of 'Universal' spaces can make children feel overwhelmed and unpredictable.

- Allowing circulation in one direction according to the daily schedule makes spaces legible.
 - Providing a visible 'option to escape' positively influences children's behaviors.
2. In the studies by Sanchez, Vazquez and Serrano in 2011,
 - Providing diffuse and natural lighting will reduce children's distractions from the light.
 - The visual background also should be neutral and uncluttered as possible.
 - Using durable fixings will limit the eventual manipulation.
 - 'Snoozelin' rooms (multisensory stimulation spaces) can help children 'attune their sensory perception'.
 - Using suitable colour coding or providing graphical cues to make spaces 'legible, predictable and imaginable' reduces the anxiety caused by the limited ability to speculate.
 3. In a study by Kinnaer, Baumers and Heylighen in 2016,
 - Using visual links with external features (e.g. landmarks) through openings helps their perception to recognize the order and understand the changes of the inside places.
 - Every function needs a fixed place to minimize the lack of engagement.
 - "Everything in its place" makes possessions on display.
 - Using replaceable elements when needed (e.g. carpet, tiles) instead of fixed ones diminishes impersonal environments.
 - The material environment should be predictable, comprehensible and controllable. Solid elements of buildings provide reassurance both physically and mentally.

- Stimulating sensory spaces and less stimulating escape spaces account for occurrences of hypo and hypersensitivity. Beneficial to be completely separate from the main area (perhaps on a slightly different level).

2. Methodology

This study runs through main three study methods; literature review, case study analysis and, analysis of interviews of purposeful sampling.

Literature Review – To understand the impact of the environment on their behavioral patterns and the intervention of architecture to derive specified architectural parameters.

Case Studies – To compare and analyze existing models with specific architectural parameters identified in the literature, and to understand the design conditions in schools for ASD in Sri Lanka to understand the architectural contribution to creating a therapeutic learning environment for school-age children with ASD.

Interviews – To further study the Sri Lankan context for the accuracy of the final discussion comprising the Sensory Symptoms against the environment of children with ASD in Sri Lanka and to understand the possible architectural applications to the realistic environment specifically about the Sri Lankan context.

In particular, were used to collect data from 15 caregivers who are directly in contact with the children with ASD,

- 3 Doctors
- 2 Therapists (speech therapists, physiotherapists)
- 7 specially trained teachers
- 3 Nurses

After studying much literature on relevant theories and sensory processing, the following parameters has identified as significantly influencing architectural aspects of designing therapeutic learning environments for children with ASD by responding to their unique sensory processing.

- I. Location
- II. Spatial Sequencing/ Organizing

- a. Zoning/ Layouts
- b. Transitions and legibility of building

III. Special Architectural Features

- a. Lighting (Natural /Artificial)
- b. Volume
- c. Colour scheme
- d. Openings
- e. Materials (Walls / Ceiling /Floor)
- f. Interior arrangements and Furniture
- g. Services and Installations

IV. Safety and Security

V. Recreational Spaces, Outdoor and landscape

3. Case Studies

International case studies: Under the discovered main architectural parameters, the Architectural and Spatial qualities of five international centres were studied. They are,

1. New Sturn autism centre
2. Eaden autism institute
3. Netly Autism Centre
4. Melisa Nellesen Center for Autism at UVU
5. Bancroft Raymond and Joanne Welsh Campus

After comparing each, the following features were identified as mutual features.

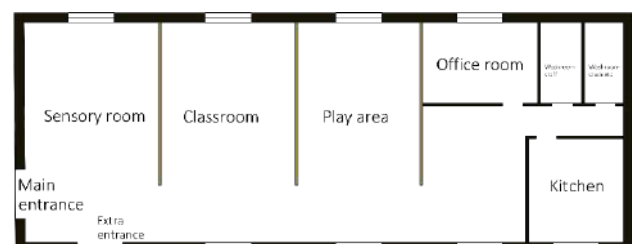


Figure 1. Plan: Autism Child Development Center
Source: Author

Table 1. Common features of all case studies

Parameter	Mutual Features
Location	Easy accessibility The strong connection with the natural environment Availability of open spaces
Spatial Sequencing/ Organizing	Legible simple layout Connected Spaces
Special Architectural Features	Simple, flexible furniture Enhanced volumes of spaces Colour use, white, grey, light greens, blues and browns Natural daylight in the buildings or mimicked natural light
Safety and Security	Building arrangements, orientations and layouts to create a naturally safe surrounding
Recreational Spaces, Outdoor and landscape	Provision for play spaces and sensory experiences.

Source: Author

Table 2. Summary of the local case study

Parameter	Feature
Location	An urban context
Spatial Sequencing/ Organizing	Simple layout, connected spaces, but not provided sufficient spaces
Special Architectural Features	Less furnishing classroom with flexible arrangements. Not any special feature
Safety and Security	Iron drills are used for all openings One way entrance
Recreational Spaces, Outdoor and landscape	Having an abounded playground with damaged equipment

Local case study: Autism Child Development Center, Maharagama. (The only government-

run, educational therapy centre for children with ASD, Sri Lanka

4. Discussion

Research by psychologists, sociologists, and professionals, confirms that children with ASD have environmental adaptation challenges.

Often they have difficulties with understanding or adapting to spaces, and they face a continual struggle to adapt to build environments which take no notice of their neural abilities and sensory perceptions. In between their special

sensory processing, it becomes challenging and distracting.

They are sensitive to the environment they bump into and have difficulties processing the information they get.

A specially designed learning environment for autistic children begins with an understanding of the range of symptoms across the spectrum. These Architectural suggestions must support the person-environment relationship. And the designers must evaluate sensory reactions to the built environment

On the other hand, the literature has proven that many design considerations for a learning environment for autism spectrum disorders are good practices for all educational spaces.

A. Analysis of Interviews

This study has conducted an extensive interviews with some selected caregivers in two stages.

1) Interview Stage 1 – School-Aged Autistic Children in Sri Lanka

Many autistic children have unique sensory needs. Anything in their environment, whether built or natural, can easily influence attention, auditory input, visual input, and movements.

According to the three positions of the Autism Spectrum, their spatial requirements differ. But especially the children who can identify as belonging to the two ends of the Spectrum show significant reactions to the environment than others. Some of them have been mentioned many times in the interviews. Comparatively, literature findings on ASD and interviews with caregivers show that a child's sensory symptoms and behavioural patterns do not differ with the location but depend on the context interaction. Every child with ASD has exceptional strengths and capacities which need individualized and distinguished programming.

2) Interview Stage 2 – Current Architectural Contribution to Autism-Friendly Environments in Sri Lanka

The main challenge faced at the beginning of the study was the gap between architecture and autism services in Sri Lanka. The professionals

who work for ASD have no idea about Architecture and what it could do for the physical and psychological well-being of an autistic child.

Many medical facilities or special educational facilities for children with special needs are designed using colourful themes, pictures, elements, and various play instruments preferred by other children but not autistics.

However, some changes can be seen that the professionals tried out autism centres' building interiors by themselves as per their experience with those children, without any knowledge of Architecture. Moreover, they have mentioned the presence of some aspects that are most needed but which could not adjust by themselves. Such as the building setting, spatial sequencing, escape spaces, naturally flow transitions and way findings, adaptive volumes, and selection of suitable building materials.

B. Analysis of Case Studies and Results of interviews

All selected international case studies are unique. They all came out as outcomes of ASD-based research designed buildings, considering to maximize the area of services they provide. Among them, many are award-winning centres for their significant architectural contribution. However, in the local context, most existing autism centres are not autism-friendly designs. Most of these buildings are once used or houses located in an urban or suburban setting based on accessibility and distance to community resources ignoring soothing views and natural features.

While international case studies follow various retreat and recreational spaces, local autism centres were not encouraged to facilitate enough retreat and recreational spaces, even providing sound play areas.

In addition, clearly defined transitions and way findings are missing in these buildings compared with international case studies to navigate children to the classrooms.

As a plus point, some of the interiors of these local classrooms create some good conditions by using light colours and simple, light-

weighted, wooden or plastic furniture in suitable scales and less flexible arrangements. But not especially concerned about acoustic solutions inside the classrooms. They also tried to take more intake of sunlight into the building. But non-using any indirect lighting technique or applications. That makes children bother by direct lights sometimes. Moreover, these classrooms were not concerned with enhancing or reducing the volume of spaces.

With their experiences, professionals know that the environment is one of the main things that impact these children's calmness and attention to commence treating, teaching or training them. Besides, the opposite is also there. The architects are not most aware of ASD. In addition to the Architects, many professional practices do not have enough awareness of ASD, even some medical-related professionals.

5. Conclusion

Autism spectrum disorder is developing worldwide due to several factors. A study led in Sri Lanka in 2009 described a prevalence of more than 1%. However, the Ministry of Health has not yet implemented a proper methodology to obtain accurate information to calculate the annual growth rate of autism in Sri Lanka. According to that, there is a lack of autism-friendly housing, urban and building environmental alternatives, and continuing education programs that cater for the needs of people with ASD.

After understanding the user perception and how to improve the spatial qualities of the educational environments for autistic children by bridging the gap between ASD-specific architectural requirements and the practice of architecture in Sri Lanka and after exploring precedents in developed countries, case-based fundamentals were derived through the study. In comparison, those design approaches adopted in the Sri Lankan context proved not standard. Because presently, individuals with ASD are an unconsidered user group in the built environment in Sri Lanka due to their specific need for the built environment.

The challenges that children with ASD face can mediate through the assistance of specifically

designed architecture. Or else, poor spatial planning will prevent those individuals from their self-esteem and achieving independence equal to every human while complicating their lives and having disfavours throughout life.

When designing for ASD, the architects and designers should understand that each individual has different sensory needs due to their behavioral patterns, besides architecturally addressing the needs of variance within the autistic spectrum. At every step of the design development process, the architect must consider how these uses can affect their senses, allowing children with hyper-sensitivity and hypo-sensitivity to educate in a space that is understandable and comfortable. Hence that design will allow them many opportunities to explore themselves. Because of the incorporation of architecturally designed space helps to maximize students' learning progress. Finally, hope this study will inspire the community to understand how different people grasp spaces and encourage architects to develop the understanding and resources to go beyond designing internal flexibility and security objectives in the Sri Lankan context to create an architecture that suits such individuals.

Furthermore, Biophilic design, bio-inspired design, patterned complexity, reduced monochromatic environments, the potential of organic layouts and forms, and fractal patterning—organized complexity, to research further for creating autism-friendly architecture to get more advanced impact.

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Authors Biography



Peshala Tashini Wickramasinghe is a final year Architecture Undergraduate of General Sir John Kotelawla Defence University, Sri Lanka.



MLNH Premarathna is a Chartered Architect, Senior Lecturer Gr I of General Sir John Kotelawla Defence University, who graduated Bachelor of Science in Built Environment with First Class Honours and did Master of Science in Architecture from the University of Moratuwa, Sri Lanka.