

# Sensory Design: Working and Community Place for Adult with Autism Spectrum Disorder in Surabaya

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**Abstract-** Adult ASD has special characters related to their reaction to sensory stimulation, hypersensitive and hyposensitive, which cause difficulty adapting in working place and daily life. This behavior should be accommodated in designing psychologically comfortable working and community place to educate them adapt in real life. Therefore, it is necessary to conduct a research on adult ASD behavior focused on sensory design and ways to accommodate those two different characters into one place.

Visual experience proposed as a macro design concept which present visual stimulation as major psychology impact in design. The design of the building elements referred to design criteria in the form of massing organization, circulation, façade, outdoor space quality, and indoor space quality on the basis of sensory design theory and adult ASD behavior.

**Index Terms-** Autism Spectrum Disorder, Behavior, Sensory, Visual Experience.

## I. INTRODUCTION

This research aims to design empowerment and community place for adult with autism spectrum disorder (ASD). Sensory design here used as foundation/design context.

### A. Research Background

Human design buildings based on their need, which then form the human behavior itself. After human behavior formed by the architecture that has been created, human reform the architecture that has been built previously based on the behavior that has been formed, and so on [1]. In designing working and community place for adult with Autism Spectrum Disorder (ASD), autism individual characteristic should be paid attention in order to help them psychologically comfort for learn adapting and socialize with their circumstances. Autistic individual has special characteristic related to their sensory senses, especially visual. They can be very sensitive (hypersensitive) or less sensitive (hyposensitive) to the sensory stimulus given surround them [2]. This sensitivity differ between each individuals and often obstruct them to adapting in working or social place. With the right treatment & training, autistic individuals can maximize their potential and closely to normal [3].

Due to this fact, behavior architecture which focused on sensory based design considered as the suitable approach to solve the problem in designing the working and community place for adult with ASD. This design majorly focused on visual sensory based

on the fact of autistic individual excellence in visual[4] and the sensory design theory itself that mention vision as the most important and influential in the relation with architecture[5]. There are two main factor/force considered important to be translated into architectural syntax: autistic individual sensitivity with sensory stimulation and adult autistic psychological needs for working. This two main factor applied in architectural element such as massing organization, circulation, facade, indoor and outdoor quality in order to fulfil the qualities and requirement of the design that will affect autistic individuals' behavior to be more open and learn to adapt an socialize with their circumstances.

### B. Research Location

The research location take place at the parking lot a UBAYA University ,Surabaya city, East Java, Indonesia. It has two entry access, first from Panjang Jiwo Street (used as main access due to the traffic intensity) and Tenggilis Street (used as service and personnel access). The location choose by some consideration such as traffic safety, noise, conture, land permit, and university nearby that has psychology faculty which has interest in autism in order to help the function of the building [Fig.1].





Fig. 1. Research location and boundaries

## II. LITERATURE REVIEW

### A. Characteristic of Autism Spectrum Disorder

According to Diagnostic and Statistical Manual of Mental Disorder fifth edition (DSM-5) there are some criteria used to diagnose the autism with specification as follows[6]:

1. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history, for example:
  - Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
  - Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures: to a total lack of facial expressions and nonverbal communication.
  - Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.
2. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history, for example:
  - Stereotyped or repetitive motor movements, use of objects, or speech
  - Insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior
  - Hyper- or hypo reactivity to sensory input or unusual interest in sensory aspects of the environment

### B. Behavior Architecture

Behavior architecture is architecture which in its application always include behavioral considerations in designing (as physical environment), that architecture design can become either as facilitator of behavior or as barrier of behavior (JB Watson, 1878-1958). Behavior architecture embodies and influences its users cyclically [7].

According to Steward Brand, human design buildings based on need, which then form the human behavior itself. After human behavior formed by the architecture that has been created, human reform the architecture that has been built previously based on the behavior that has been formed, and so on [1]. There are some variable that affect the human behavior: space; size and shape; furnitures and their arrangement; color; sound, temperatures, and lighting [8].

### C. Sensory Design

Sensory design is a designing method that places occupants as the focus of design by paying close attention to how space can

affect them in short or long term. Sensory design is influential in creating a responsive architecture, a design that interacts with people. Responsive architecture involves residents with their surroundings and their impact on how residents feel, think, and behave. Architecture can improve the human lifestyle. The main human senses contains of vision, taste, touch, smell, and hearing, with the relationship to the architecture as follows [5]:

- a) Vision  
Vision considered as the most important and influential. Human eyes work together with all their other senses, which is the other senses confirm what the eyes sees.
- b) Taste and smell  
Odor has power to capture and preserve the memory of any space.
- c) Haptic / Touch  
The haptic system consists of every stimulus that involves touch. It is the process of learning the object through its physical properties. The sense of touch often called a subconscious vision that can provide three-dimensional information.
- d) Hearing  
Hearing is the kind of sense that spread. However, the noise can be used to create a certain atmosphere. In buildings, the silence interact with our perception, and at the same time we can visualize.

According to Mostafa [2], the presence of a low stimulus environment plays an important role in maintaining the concentration of autistic individual. If the space is designed to be comfortable for autistic individuals, they will become more focused and able to interact [9]

### D. Design for Autism

According to Mostafa [2] there are two special needs of space for autism: *spatial function sequencing* (consisting of sequences, sequences and routines) and *visual attributes* (consisting of visual cues, visual disturbances and visual support). These two special needs of space can respond to the authenticity of the visual sense of the autistic individuals in interaction with space and vegetation which can be described as follows:

#### a) Spatial function sequencing

Created with purpose to intervening environment among the autistic individual which they consider chaotic and unlimited, by providing patterns or structures in the room and also their regulation to the relation between space (order-sequences). Those space arrangements can give direction for autistic individuals to certain space functions in order to perform activities and create a routine.

#### b) Visual Attributes

A visual element affects the autistic individual. It can not be separated from the *order of space* that can create a *visual clues* for them to understand easily their surrounding environment by arranging interior furniture and the people involved in the room. Otherwise the *visual distraction* is an element to divert the attention of individuals who are fixated on constant and repetitive things. Visual support presented as *signage* for autistic individuals that used to interact with people and space.

Another important aspect of creating an environment suitable for autism is the circulation design. In both the inner and outer space contexts, each function must be designed with a clear circulation path. Similar to autistic treatment facilities, each goal must have a definite marker in order to be identified clearly. This is necessary because autistic individuals can not think abstractly, and they will have difficulty in identifying the same space that has the same function.

### III. METHODOLOGY

Based on the type of data, the research categorized as descriptive qualitative research. Nigel Cross [10] *Exploring design situation* used as the method for data collecting, which contains:

1. Literature Searching: related to autism behavior, sensory design, design for autism, & building function standard.
2. Interviewing User: interviewing psychiatrist specialized with autism and parents of the autism individual.
3. Investigating User Behavior: focused on adult ASD behavior, reaction to sensory stimulation, needs, and potential.

*Forced-based method* used as the design method, namely the design respond to non-formal factors (can be out from architecture disciplines) in order to fulfill requirements and qualities needed in design. This *force-based method* has a series of frameworks as follows[11]:

- a) *context/culture/needs-identify force*: finding main factor/force that may influence problems of design dealing with adult ASD behavior
- b) *propose forms*: apply *force* to design and relate it with the design requirement resulting a design concept
- c) *refine and assemble system*: assembling and checking the relation between every design elements and *force* in order to continue to the more detail step of design.
- d) *proposal*: a comprehensive proposal in the form of schematic building design.

### IV. RESULT AND DISCUSSION

The research result analyzed to obtain design criteria. This design criteria determined to be used as design manual, and formed macro concept as result.

*Visual experience* proposed as macro design concept, by presenting integrated variety of visual experience consist of indoor, semi outdoor, and outdoor space as major sensory stimulus in the design. This concept consideration based on research fact of autistic individuals excellence in visual [4], so it can be conclude that visual stimulus become the biggest sensory stimulus impact for autistic individuals that can affect them psychologically to behave better.

The design criteria divided based on architectural elements namely massing organization, circulation, facade, indoor space quality, and outdoor space quality, with description as follows:

#### A. Massing Organization

Massing organization become the widest aspect to be considered in designing based on *visual experience macro concept*. The whole massing concept must provide the formation of multi kind of space such as indoor, semi-outdoor, and outdoor space in order to give variety of spatial and visual experience.

This spatial and visual experience variety should be softly integrated based on function, safety, and autistic individuals' psychology comfort.

Massing organization divided into 4 major area based on user activity as follows [Fig.2]:

- Public and administration area: mainly for public and staff. Consist of 3 mass: main entrance and lobby; office and gallery; library and cafeteria. Located in front of the site seen from main entrance
- Working and interaction area: mainly for autistic individuals and public visitors. Consist of 5 mass: ranch; IT and system; craft and market; shows and food court; performing studio. Located between public and dorm area.
- Private and dormitory area: mainly for autistic individuals and their caregivers. Consist of 10 mass of dorm. Located in back of the site seen from main entrance
- Service area: for service activity. Located spreadly at the edge of site to accommodate other area's needs.



Fig. 2. Massing organization based on area: public and administration (blue); working and interaction (yellow); private and dormitory (red); service (purple)



Fig. 3. Massing organization provide the formation of outdoor space

Based on *context force* (location's lack of view) and consideration of privacy and noise-comfort needs, therefore the site's view oriented inside with integration with view into site. Some area lowered to create more private space, for example: dormitory area. Massing organization of each area oriented to create outdoor communal space in the middle so that autistic individuals visually stimulated to see socialization activities around them [Fig.3].

**B. Circulation**

- Organized based on autistic individuals' routinely sequence and users type
- Simple linear circulation that easily understood with signage like color and patterned form as identity [Fig 5]
- Physically boundaries but visually accessible access for autistic individual in working area [Fig.5]
- Healing element like trees, pond, and garden surrounding autistic individuals' circulation as a relaxing stimulation



Fig. 4. Simple linear circulation arrangement of dormitory area: autistic individual (pink); service (green); supervision spot (yellow); outdoor communal space (blue)



Fig. 5. Above: physically boundaries but visually accessible access for autistic individual in working area. Below: the color of pathways pattern used as signage

**C. Facade**

- Used of warm and neutral color as dominant in design [Fig.6], and some bold or bright color [Fig.5] as needed, for example: as a signage.
- Simple geometrical shape with soft corner at some place with high intensity circulation[Fig.6].

- Safe material as needed for example: rubber material for some corner.
- Acoustic isolator material as needed for example: in relaxing room wall
- Neat repetition of some building elements such as column, texture [Fig.7]



Fig. 6. Use of warm neutral color and soft corner at living room

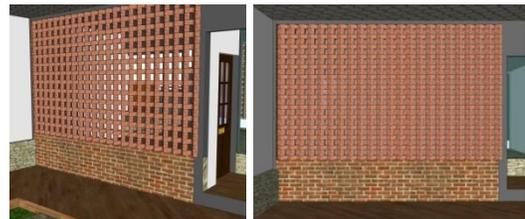


Fig. 7. Repetitive pattern used for see-through wall which provide visual experience and air circulation

**D. Outdoor Space Quality**

- Provide sociopetal place for autistic individual to interact along with healing element for relaxing sensory stimulus [Fig.8].
- Arrangement of transitional space between indoor and outdoor space to give relaxing ambiance and variety visual experience [Fig.9].
- Outdoor space provide working and interaction activity with consideration of privacy and safety factor such as noise, supervision access.

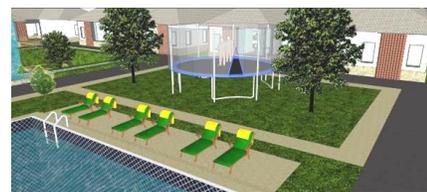


Fig. 8. Communal outdoor space at dormitory area provide healing and active ambiance (based on each function) by giving visual stimulus such as tree, color, repetition elements



Fig. 9. Transitional space between indoor and outdoor space to give relaxing ambiance and variety visual experience

#### E. Indoor Space Quality

- Provide sociopetal place for autistic individual to interact with more intimate scale [Fig.6].
- Provide private individual space for relaxing [Fig.10].
- Use of natural or artificial indirect lighting to give sufficient light intensity and to avoid glare or over sensory stimulation [Fig.11].
- Open ventilation and natural lighting to give an open and natural sensation [Fig.11].
- Room and furniture dimension based on adult autism privacy character and body measurement



Fig. 10. Private individual space for relaxing

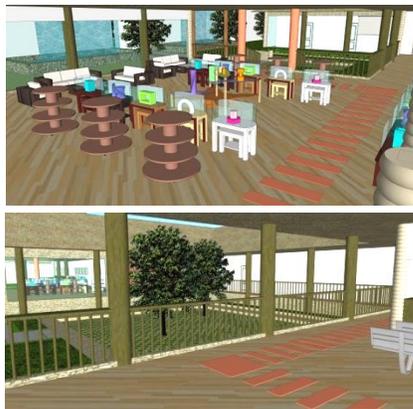


Fig. 11. Open ventilation and natural lighting to give an open and natural sensation.

#### V. CONCLUSION

Visual experience as macro design concept proposed as solution to autistic individuals' sensory stimulus sensitivity, by presenting variety of visual stimulation as major psychology impact in design. The macro concept which obtained from the

design criteria applied in massing organization, circulation, facade, outdoor space quality, and indoor space quality give psychological comfort to autistic individual that may help them learn to adapt and socialize. Some important criteria to applied as follows:

- The design must provide right sensory stimulation based on autistic individual's need, especially visual sensory
- Healing but interactive atmosphere
- The important of supervision access and safety for autistic individual itself

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