Human-Centered Design Approach in Art Therapy Center for Autistic Children with Sensory Dysfunction

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Abstract. The more in-depth development of autism treatment means that children with autism are no longer learning only through Special Schools (SLB). Treatment efforts for autistic children have been carried out in Indonesia to aid growth and development. However, not all places of therapy for autistic children provide an additional platform for them to express themselves creatively, such as through art therapy methods. For example, art therapy, which uses nonverbal expressions expressed through works of art, can help children with autism who have difficulty expressing themselves verbally. Art therapy also aids motor and sensory development in children with autism who have hyper-sensory or hypo-sensory dysfunctions. We can focus the design on the differences in sensory dysfunction that autistic children have, which are implemented in the results of designs and design solutions that can improve the process of development and growth of children with autism using the Human-Centered Design (HCD) approach. The qualitative data for the study was gathered through literature studies, observations, field surveys, and interviews.

1 Introduction

The conditions of people with autism are becoming more varied and complex [1]. As a result, scientific advancement and more comprehensive treatment of a person with autism are required. People with autism are no longer generalized and are only educated in Special Schools (SLB). Many other therapeutic efforts, however, can aid in the development of a person with autism. Sensory dysfunction appears as two different behaviors in people with autism: hyper-sensory and hypo-sensory [2]. People with hyper-sensory autism have excessive sensitivity to sensory input, resulting in excessive behavior such as hyperactivity, unstable emotions, and tantrums. People with hypo-sensory autism, on the other hand, are less sensitive to sensory perception, which causes them to be slow in responding to things around them, forming their passive personality [2].

In small-scale experiments, it was found that art therapy, such as music therapy, drama therapy, and art therapy, contributed to positive changes in children with autism, such as changes in social behavior, levels of focus, and relaxation [3]. Art therapy aims to improve a child's ability to deal with problems, increase self-confidence, learn to listen to others, ask for help, develop cooperative attitudes, express oneself, get better at differentiating between reality and fantasy, reduce fear, and have more flexible behavior [3]. Furthermore, using nonverbal expressions through experiences, such as creating art, can encourage a child with autism to begin representing his experiences.

More profound knowledge and considerations are required when designing interiors for children with autism who have different sensory sensitivities than typical children. “One size fits all” is not a design solution for individuals who have special needs and considerations for their sensory features [4]. Human-Centered Design (HCD), In term used to describe user integration in a design process [5]. A designer must understand the needs of humans or users when designing the interior design of a space, which serves as the foundation for designing an ideal space to live in. With a better understanding of HCD, children with autism will become the primary subjects of the design, with the results affecting an increase in social interaction, self-motivation, and individual self-confidence. As a result, the interior design of an art therapy center for children with autism is expected to improve the process of their development and growth and produce a change effect that can reduce the behavior problems of children with autism.

2 Research Methods

2.1 Research Methods

The qualitative data collection method was used in the design of the interior of an art therapy center for children with autism in Banten. Data will be gathered through literature reviews, observations, field surveys, and interviews.

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2.2 Study Literature

Literature studies use the Google Scholar program to search for journals related to this research. The journals are about autism, autism in children, and art therapy in autistic children. Journal citations will be included in the literature review section.

2.3 Observation

Because of the current COVID-19 pandemic, observations will combine on-site and web survey data. The survey will be conducted at three Jakarta child development clinics: Honeybee, Kailila, and Pela 9. The reason for selecting a child development clinic in Jakarta is that they are in the same scope and discuss the same issues. Aside from that, each clinic has a vision, mission, programs, and other similar activities.

2.4 Interview

Direct debriefing was used to collect data, with questions submitted in writing and given to two psychologists to obtain the information and perceptions needed for the design. The interviews will be used to create art therapy interiors for autistic children.

2.5 Design Stages

The design process is divided into several stages (Figure 1). The first stage is selecting a theme, which determines where the discussion area will go, followed by selecting a design title. After getting the title to use, the next step is to collect keywords related to the theme or topic of discussion. After that, conduct a literature review using online resources, specifically Google Scholar. After looking for several supporting references, it determined the problem boundaries in planning, followed by survey observations in three locations and interviews with three child psychologists. The next step is the analysis of previously observed data and professional interviews. Then the design proceeds to the stage of finding a design.

3 Results and Discussion

3.1 Design Statement Scheme

The interior design of the art therapy center for children with autism aims to aid the process of growth and development for children with special needs, specifically children with autism. Children with autism or autism spectrum disorder (ASD) have a variety of symptoms or disorders, including hyper-sensory and hypo-sensory dysfunctions, which are the focus of this art therapy center's interior design. A mind map was created using the lotus blossom method to create the following concept that is inherent in autistic children:

![Lotus Blossom Mind Map](image)

Fig. 2. Lotus Blossom Mind Map.

Keywords extracted from Figure 2 include multisensory, artistic activities, simple shapes, warm colors, cool colors, cheerful and calm.

3.2 Design Concepts

As shown in Figure 3, this design aims to create an art therapy space specifically for children with autism, where they can do therapy, study, consult, play, and socialize. Another goal of this design is for this therapy center to be a place where children with autism can train multisensory visually and physically, as well as a space where sensory dysfunction disorders in children with hyper-sensory and hypo-sensory autism can be met. As a result, the design is carried out using a Human-Centered Design (HCD) approach. Children with autism are the primary user focus in this design using the Human-Centered Design (HCD) approach. This boils down to the different dysfunctional problems of children with autism, hyper-sensory and hypo-sensory autism children.

The design statement concept "Bulir Rupa Nakia" is taken from the translation of the words "autism" and "art"; these two words are very close to the goal of developing art therapy for autistic children. The differences produced by each child with autism in his artwork will show a variety of expressions, making each child with autism unique. Furthermore, the statement design concept is applied to interior elements that form spaces that can adapt to the sensory dysfunction of autistic children.

The use of colors in this design adapts to differences in sensory dysfunction in hyper-sensory and hypo-sensory children with autism, which are divided into cool colors, which give a favorable impression, and warm colors, which give a positive impression and provide stimulus to children [6]. The use of shapes is also dominated by circular, curved shapes, which soften the room for children with autism [7]. The division or organization of space uses linear circulation, which makes the division of space predictable for children with autism so that it does not complicate their mobilization.

![Schematic Design Stages](image)

Fig. 1. Schematic Design Stages.
3.3 Design Statement

In Figure 4, the word "Bulir Rupa Nakia" is derived from the translation of the words "autism" and "art," which are the main topics of the design. The Big Indonesian Dictionary (KBBI) defines "bulir" (grain) as stalks with compound fruit (flowers). Each grain is different in size; this represents how each child with autism has a spectrum or symptoms that are unique to each individual, which makes children with autism special. Then the word "Fine" is closely related to "Art" Fine Arts. Fine arts encompass a wide range of characteristics, techniques, styles, and media. Rupa represents how each autistic child has diversity in communicating through his artwork during the therapy process, and "Nakia" means pure or holy, which is a picture where the expressions, actions, and behaviors shown by autistic children are pure from within themselves. For example, when children with autism feel calm, comfortable, talkative, or cheerful, the response expresses what they are or is pure from themselves.

3.4 Mood Board and Space Image

The image of space and mood depicted in the entire interior of art therapy for children with autism is filled with fun and warmth. The image of a pleasant and warm environment responds to the purpose of designing art therapy, which is expected to aid in the growth and development of children with autism. This pleasant and warm impression is implemented in interior elements such as colors, shapes, materials, lighting, ventilation, furniture, and other interior supporting elements that can provide a pleasant therapeutic experience and train multisensory visually and physically for autistic children.

3.5 Shape Concepts

Abstract shapes distract children with autism, so consistent and neatly arranged shapes will make them feel more at ease in the room [2]. The dominance of circles and curves in a room intended for hyper-sensory children can give the impression of softening the space. In contrast, shapes with a predominance of angles in a room for children with hypo-sensory dysfunction will give a firm and active impression due to firm changes in direction, and hypo-sensory children will be more stimulated [7].

3.6 Color Concept

The interior design of an art therapy center for children with autism necessitates using colors that correspond to these children's sensory dysfunctions, namely hyper-sensory and hypo-sensory. Based on interviews with child psychologists, Ms. Katarina Ira Puspita, S. Psi., M. Psi, and Ms. Luthania Anita, M. Psi, explained that using neutral colors is the better dominant color for spaces designated for children with autism. The dominant neutral colors are white and brown, combined with soft or subtle colors in the sub-dominant colors, namely blue and green, which are frequently found by children in their surroundings to make them feel familiar.

4 Interior Design Art Therapy for Autistic Children with Human-Centered Design Approach

It is recommended to do in-depth research and observation about autistic children in designing an art therapy center for autistic children. For example, designing an interior that is intended for children with autism does not only pay attention to aspects of the interior elements but also pays attention to the functions and facilities provided that can meet the needs of children with autism. and also help with sensory dysfunction problems with supporting interior elements that can develop multisensory children with autism both visually and physically. Figure 5 illustrates how the design layout divides room for art therapy class according to their needs, where the type of classes are divided into two; individual and group classroom, that based on the the stage of the curriculum at the art therapy center.

Figure 6 visually shows how the division of areas in one big space, where the play area for children with autism could be seen from the reception and waiting area.

Additionally, technology can serve as an assistive tool for kids with learning disabilities (LD) to replace skills that are either lacking or impaired [8]. Increasing the use of assistive technology during cooperative
learning activities can boost the participation of students with LD in avoiding hurdles associated to certain disabilities, in addition to providing facilities to aid children with autism with their shortcomings.

Fig. 5. Design Layout Art Therapy Class for Autistic Children.

Fig. 6. Design Layout for Reception and Play Area Therapy Center for Autistic Children.

4.1 Human-Centered Design Concept

In interiors, Human-Centered Design (HCD) requires designers to consider various factors in users' activities or experiences in a room [5]. Like design thinking, human-centered design is also carried out through a process to achieve design solutions. However, what makes human-centered design different from design thinking is its focus on the primary user of the room. Human-Centered Design (HCD), according to IDEO, is a creative problem-solving methodology that starts with the intended user and leads to original solutions [9].

4.2 Inspiration

At this stage, a designer observes the user's existing space, studies habits, psychological conditions, and how to use the space [5]. In terms of sensory dysfunction problems owned by children with autism, at this stage, the designer pays attention to aspects of the multisensory needs of children with autism.

4.3 Ideation

Based on the data obtained from the inspiration, the designer develops his ideas from the user's problems at the ideation stage. [5] explains that building the atmosphere and mood of a space does not only put color, light, aroma, temperature, texture, and material but aims to convey the user's experience in space. Idea development is developed into the results of design studies that have been previously described starting from the concept of shape, color concept, material concept, lighting concept, and acoustic concept, which leads to the overall design concept to produce design solutions that can train multisensory children with autism sensory dysfunction hyper-sensory and hypo-sensory both visually and physically.

5 Human-Centered Design Implementation

The implementation stage is the final result of developing the results of the design study that has been described previously. The design results are generated from the space-forming elements and the space-forming complementary elements, utilities, and the facilities provided at the art therapy center for children with autism. At this stage, the human-centered design approach expects that the user in the interior can provide continuous positive stimulation [5]. In the context of children with autism, it is hoped that their development and growth through sensory training activities can continue to positively impact both reducing behavioral and sensory problems that children with autism have.

The use of materials considers the function and placement of each room, including the material on the floor, walls, ceiling, and furniture in the interior. The material's color is also vital in rooms designed for children with autism because color influences the stimulus they receive through their visuals. In addition to the visual, the material's texture considers where the material is placed for the sense of touch or physical that can be felt. For example, the floor material uses materials that adapt to the function of the space, such as non-slip, easy-to-clean, and durable materials in open spaces and high mobility, such as the entry area and the therapy room.

[11] In addition, the rehabilitation center suggests selecting material that is more natural and comfortable for autistic children like bamboo, plastic, cotton, and linen. It could also limit materials with strong reflective properties. Like metal to reduce the number of children's sense of being cold and increase their sense of safety with warm materials.
Combining materials with smooth, soft, and rough textures on the walls adds a new dimension to the visual and physical experiences of children with autism; however, in certain rooms where children with autism play, soft walls are used to avoid bumps while playing (Figure 9). The material used in the ceiling area takes advantage of the difference in height and lowness to keep the room from looking monotonous and flat. The ceiling combines white, which creates the illusion of a high and expansive space, with some of the same colors as the wall material. The furniture will be made of materials with duco paint finishes and HPL, which is easy to maintain and long-lasting. To avoid bumps and keep children with autism safe, use soft materials in the sitting and playing areas.

As one of the vital parts of designing room for children with autism, the implementation of the colors used in each room that shown in Figure 8 and 9 is divided into three, namely dominant, sub-dominant and accent colors. White as a dominant color acts as a neutral color that can give a relaxing, calm, and soothing effect to a room by mixing it [6]. Chocolate: [6] explains that brown is a neutral color to apply to a room. In addition, the color brown also represents a warm, safe, and down-to-earth impression [12].

Blue as a sub-dominant color: a "cool" color intended for children with hyper-sensory autism, which has a relaxed, trusting, and psychologically soft effect [6]. [6] also explained that blue is commonly used in spaces that need calm and concentration. And green color: for hypo-sensory children who need more stimulus, green can have a warm and cheerful effect, and psychologically, green has a healing and healthy meaning [6].

And purple as an accent: the color purple as an accent color is obtained from the results of an analogous scheme of blue, where an analogous scheme is needed for hyper-sensory children, which produces a combination of colors that are not too contrasting and a complementary scheme of yellow, which is suitable for hypo-sensory children who will help the stimulus. In addition, purple is part of the "cool" color, which can have a calming effect on hyper-sensory children. [6] also explained that purple symbolizes creativity. In addition to the application of purple, yellow is also defined as an accent color obtained from the analogous results of green and a complementary scheme of purple. [7] explained that yellow gives the impression of being cheerful, warm, bright, soft, and serene. In addition, yellow is also part of the "warm" color group needed by hypo-sensory children.

[11] As you can see the color preference test records of autistic children indicated that blue dan green should be chosen as the space’s primary tones and a decorative material with a high color purity. The rehab is aided by children’s ability to manage their emotions and adjust to their new surroundings.

Figure 7 displays that the interior design of this art therapy center takes on a geometric shape by combining curved shapes and firm lines. Interior element patterns, floors, walls, ceilings, and furniture all use curved geometric shapes and firm lines. The study of shapes is inspired by a combination of three shapes: hand figures forming clay, happy child gestures, and figures of therapists and children holding hands. First, the shape is simplified into a unified pattern by combining straight and curved line elements as dominance.

**Fig. 7. Shape Study of Interior for Autistic Children.**

The first shape was inspired by two hands forming clay, which was then simplified into a simple shape with basic geometric shapes of circles and curved lines.

Furthermore, the second shape was inspired by a child figure with a happy gesture of raising his hand, which was then simplified to a more straightforward form, a circular geometric shape combined with firm and curved lines. Finally, it is represented as a place for art therapy by the third form of inspiration, a therapist and a child holding hands. These figures are simplified into simple shapes, basic geometric shapes of circles, and curved lines that give the impression of being gentle and friendly.

**Fig. 8. Art Therapy Class for Autistic Children.**

The implementation of the light within the interior is illustrated in Figure 9. A combination of natural and artificial lighting is used in the lighting concept. Natural lighting is provided by window openings in the building facade that allow sunlight to enter the room. However, the interior design of art therapy for children with autism makes extensive use of artificial lighting because natural lighting makes people with autism sensitive to changes in light that cannot be regulated. In contrast, Winterbottom and Wilkins recommend that lights with a color temperature of 3500 Kelvin be used to provide lighting for people with autism [4].

The use of artificial lighting is divided into direct and indirect lighting. First, direct lightings, such as spotlights and downlights, is the primary light source in interior spaces. Then indirect lighting is used as accent lighting in the interior to give a different effect and emphasize an interior element that becomes the focal point in the room so it stands out more.
There are exercises to train basic skills and everyday living abilities to improve the abilities of autistic children, in addition to focusing on them in therapy through creative activities. Devices like iPads and tablets, which are more versatile, help with the implementation of assistive technology in the educational setting [8]. Big Blue Box Farm, I Get...Cooking, The Photo Cookbook-Quick & Easy, and Put It Away are a few examples of assistive technology mobile learning apps made specifically for people with autism spectrum disorder (ASD) [8]. These apps' functions are geared toward assisting autistic children in enhancing their abilities in terms of cognitive, social, motor, constructive, and daily life skills.

6 Conclusions

"One size fits all" is not a design solution for individuals who have special needs and considerations for their sensory features [4]. Designing interiors that are intended for children with autism with differences in sensory dysfunction, which are divided into hypersensory and hypo-sensory autism children, requires in-depth consideration of all aspects of the interior elements, starting from the use of colors, shapes, materials, organizational circulation between rooms, lighting, and furniture used. In addition to interior elements, in designing interiors specifically for children with autism, the facilities also adjust to their needs which can help the development and growth of children with autism. By applying the understanding of Human-Centered Design (HCD) in this design, it is hoped that it will reduce behavioral problems that children with autism have and create an interior that provides a different experience of activities, learning, and socializing with autism.

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