



Furniture Design as a Sensory Product Approach in Autism Therapy for Children

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Abstract

Autism Spectrum Problem (ASD) is a childhood communication and behavioral disorder. Even though ASD is a lifelong condition, medications and therapies can help autistic children with their symptoms and abilities to function. The research uncovers the viability of furniture design solution as an alternative sensory product that considers autistic children's outbursts as it relates to their surrounding and environment. The purpose of the study is to discover how sensory products can assist autistic children by analyzing the Three Levels of Design prescribed by Don Norman, focusing on the Visceral, Behavioral and Reflective elements that apply to the furniture design domain.

Keywords: Furniture Design; Product Design; Autism Therapy; Design Research

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1.0 Introduction

Autism Spectrum Disorder (ASD) is a communication and behavioral disorder that is diagnosed at any age and categorized as a developmental disorder due to initial symptoms that typically appear in the first two years of a person's life. People with ASD often have difficulty communicating and interacting with everyone due to their limited scope of interest. At the same time, they tend to engage in repetitive behaviors which hinder their ability to function normally. Autism is a "spectrum" disorder because of the varying degree of patterns and severity of the symptoms. Despite being a lifelong condition, at present, there are treatments and therapies available for various useful functions. As in the case of the present research, the study narrows into the application of therapy for controlling outbursts in autistic children. Analysis of existing products and solutions observed that development has tended to focus on product solutions such as therapy and training to control the sensory needs of children with autism spectrum. Since every spectrum is unique, the occupational therapist will determine the child's sensory processing needs and tailor interventions to meet these individualized needs. Most studies, therefore, looked into the practical user-centered design (Cañete Yaque & Peralta-Álvarez, 2022) or futuristic approach which looks into robotic applications (Anwar et al., 2022). The similarities lie in the focus on allowing autistic children to develop independence in their daily activities. Meanwhile, there are very few studies that focus on the emotional outburst of autistic children from a product design approach, and it is even rarer to find one that applies it to furniture design. Therefore, with the identified gap, the current study investigates the efficacy of furniture as an alternative therapeutic strategy for reducing outbursts in children with ASD at home. It is believed and proven that improving the product's design and functionality can aid and support them in their learning process while also assisting them

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with their sensory difficulties and social skills. The expected outcome will propose some of the functionalities of existing products in the home furniture.

1.1 Furniture Design Concept Solution

By trait, most autistic children have problems with communication, social skills and sensory sensitivity. Since autistic children are hypersensitive to certain sensory triggers, their environment and surroundings are essential to them. For example, they resisted any changes in their daily routine as it would cause them to have an outburst. Autistic children will always have a hard time concentrating on anything that does not appeal to them, yet they will not know how to be self-sufficient. As per research, when they are engaged in self-stimulatory behavior, they have trouble learning even a basic task.

According to existing product research, there is no self-sufficient therapeutic furniture designed specifically for autistic children. Some of them were made for other children with special needs in most of them were made outside of Malaysia. Inadvertently, the prices of the furniture are prohibitively expensive to own, particularly for families with autistic children. Aside from that, Malaysians are unaware of the opportunities for autistic children to live a normal life because of their therapy. Many of them believe that autistic children cannot be independent, but they can with the assistance of therapy.

Since Malaysians are unfamiliar with the treatments, no furniture has been made by Malaysian furniture designers. They have limits because the study needs to be broadened to explore. According to recent research, there is no distinct category for furniture that can be designed specifically for autistic children. Although existing furniture can be utilized, there is no convincing evidence that the furniture can aid autistic children.

2.0 Literature Review

The current study provides new insights into how to manage outburst issues in autistic children using therapy furniture. It will provide needed awareness of the fact that autistic children's outbursts can be reduced with the suitable criteria on therapy furniture. This study will benefit industry, particularly the furniture industry, by providing an opportunity to develop new products that will aid autistic children while also increasing the economy. The research will provide information for activists to use in furthering their campaign to raise awareness about how to care for autistic children. This study may persuade parents to think about therapy furniture for their autistic children. As a result, the findings of this study can be applied to future discussions about the possibilities of therapy furniture in reducing autistic children's outbursts.

2.1 Autism in Malaysia

At present, there is no official registry for autism in Malaysia due to the lack of ASD information (Abu Hassan et al., 2022). Estimation of the prevalence of ASD in Malaysia is estimated at 1.6 in 1,000 children (Aziz, 2022). In 2020, a total of 549 children were diagnosed, decreasing from a total of 711 children the previous year. Meanwhile, in 2021, the number remained consistent at about 589 children. As many instances are suspected to go unreported the true prevalence rate of autism in Malaysia is likely greater. Despite a significant statistical number, Malaysian parents still lack an understanding of the spectrum and available products, services and therapy.

2.1.1 Existing Therapy Solution

Many families of autistic children choose to incorporate a range of therapies into the daily or weekly routine. Some of these therapies are available at school, while others are only available in public and private therapy centers. Although there is no conventional treatment for autism spectrum disorder, there are techniques to minimize the symptoms and maximize abilities. The most effective therapies and interventions are frequently unique to everyone. The treatment can significantly lessen symptoms and assist autistic children with daily tasks. Treatment must focus on the needs of the children rather than the diagnostic categorization (Thompson, 2013).

One of the treatments that autistic children frequently receive is behavior management therapy, which aims to reward desired behaviors while decreasing undesired behaviors. It also recommends what caregivers can do before, during, after, and in between instances of undesirable behavior. Applied Behavior Analysis (ABA), a widely established approach that tracks a child's progress in developing his or her skills, is frequently used in behavioral treatment (Gitimoghaddam et al., 2022). Aside from that, cognitive behavior therapy is one of the therapies that focuses on the connection between autistic children's thoughts, feelings, and behaviors. Throughout the sessions, the autistic person learns to recognize and adjust thoughts that contribute to problematic moods or behaviors in specific situations. According to research, this therapy can help autistic children with some types of ASD manage their anxiety. It can also assist with autism in managing social situations and understanding emotions more effectively.

Concerning the current study, there is an exciting recent inquiry into furniture design for autism. Among them, Lopes et al. (2022) studied furniture design for autism by focusing on discovering characteristics that allow a child to interact with another individual with sensory maps. Exploration was targeted into the various applications of fabric related to furniture. Meanwhile, Purnamasari and SR (2022) explored the design, construction, texture, color and finishing of tables used for ABA sessions. On a wider but related scope, some of the studies look at space, facilities and layout to accommodate autistic individuals (Giofrè, 2022; Shimokura et al., 2022). This specifically designed environment incorporates therapeutic surroundings such as calm rooms, soft playrooms, sensory rooms or terraces.

All in all, the reading on existing solutions concludes furniture design solutions that either rely on the effect of tangible material on the effectiveness of therapy sessions or they tended to focus on characteristics of the specific spaces concerning the therapy sessions.

With regards to the gap in this current study, exploration into home-based therapy furniture and the concept of designer versus user perception of its appearance and utility is deeply lacking.

2.1.2 Outburst in Autistic Children

Anger is a common symptom among autistic children. An insightful study on emotion dysregulation among children with ASD by Mills et al. (2022) attributes a big part of the ED cases are reported ED and not observed ED. A significant finding from the study shows that higher levels of ED are reported by parents who indicated higher levels of stress and lower levels of mindful parenting. This clear importance is placed on parents' stress level as a determining factor for controlling ED cases, there is more need for home-based assistive or alternative therapy that allows children with ASD to occupy and function with minimal supervision. Children with ASD tend to engage in repetitive thinking, which can result in rage if it is mixed with anger or frustration. Beck et al. (2020) outlines that children with ASD tend to have impaired emotional regulation (ER) due to high reactivity to situations, inflexible emotional state and difficulty in calming down during distress. Existing studies measuring ER rely on direct observation and behavior coding by putting the participant in a controlled frustrating situation that elicits emotional reactions. As of the current time, there are already numerous studies that can lay out in detail the phenomena of ED among children with ASD. Therefore, the current study will apply this knowledge to the initial product attributes which will later be tested in a controlled environment observation to identify only the positive effects of the design.

3.0 Method and Conceptual Framework

3.1 Method

This current paper reports on the findings from video observation supported by literature reviews on existing autism products and therapy. The preliminary study started at the end of 2021, during the transition of the COVID-19 pandemic stage into an endemic state. An in-person visit to therapy centers to observe children with ASD is still restricted. Therefore, the preliminary study was only conducted via video observation of existing available videos on autism-related videos that include therapy demonstrations, docu-series on specific case studies involving tantrum episodes of children with ASD, Autism behavior and calming strategies. The entire process is conducted as a preliminary study followed by a two-phase data collection exercise and data source triangulation analysis. The following image seen in Figure 1 visualizes how the design method and research method are mapped out strategically.

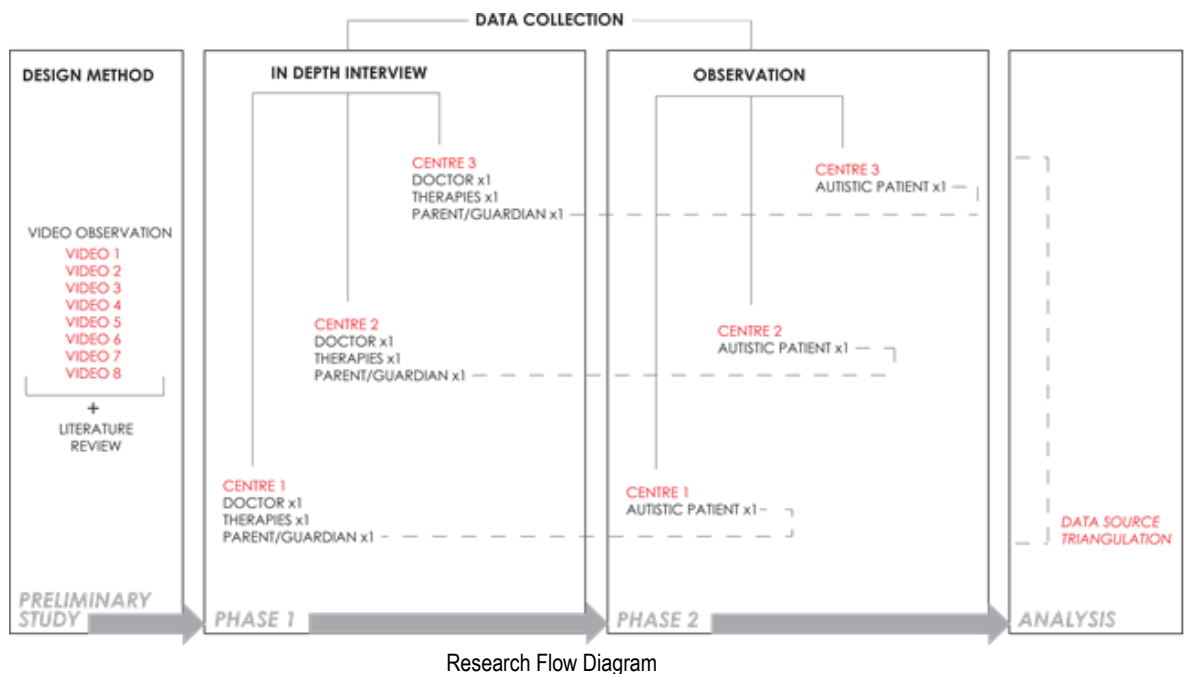


Figure 1: Design Method and

The research method, as a design research method, factors not just on the philosophical belief system on social reality from a qualitative ontology, it also reflects on the designer as part of this reality. The method takes into consideration the priming process of the designer as a researcher by building intuitive expertise in the case (Toyong & Abidin, 2021). This preliminary finding will be followed by a qualitative research method via observation and a co-creation exercise. Attribute findings of product appearance and utility developed at this stage can be further enhanced through co-creation that is designed as a research case into autism therapy. As practiced in research into design, the value creation aspect of the insight lies in identifying experiences that were otherwise unknown before (Isa & Liem, 2021). Incorporating co-creation as a means for validating findings strengthens the process of design research. In

this case, the designer, as a researcher, takes on the hat of the strategist and evaluator as they observe how the product is being used in existing and new contexts (Ali & Liem, 2015; Drain et al., 2018; Jian et al., 2022).

3.2 Sampling and Scope of Study

In the preliminary study, the research utilizes a design method of video observation on available resources from video video-sharing websites. The total amount of videos was decided based on it reaching saturation point. Meanwhile, the Interview sessions include occupational therapists and parents/caregivers of children with ASD aged 2 to 6, identified as the age group that will benefit the most through early therapy intervention (Lopes et al., 2022). The observation of children with ASD will only be conducted in user feedback setting under the strict observation of occupational therapists. For data triangulation purposes, the data will be collected in three different centers with similar characteristics. The study is scoped at urban areas because the majority of centers specializing in autism spectrum disorder are located in cities, which is Klang Valley. Furthermore, expertise, such as Doctors and Therapists for Autism Spectrum Disorder, is concentrated in urban areas, resulting in a high possibility of relevant knowledge.

3.2 Conceptual Framework

As established earlier, the design of the product will take into consideration both the audience/ user as well as the maker/designer's point of view. To understand the significance of emotion from the designer's perspective, a goal must be clearly defined. To establish a guiding framework for the research, the three-level of design by Norman (2005) provides a visceral, behavioral and reflective lens for study. A model of the Three levels of design is visualized in Figure 2. Theoretically, the designer would focus on translating a product's numerous restrictions and dimensions into a single output, leaving discrepancies of user versus designer perceptions only at an emotional level. This is because emotion is not built into a product, instead, it is developed based on the experience of the intended user. In the case of the present study, as established earlier, the emotional degree of an autistic child is itself the focus of the investigation. Not only does emotion play an important role, it becomes the purpose of product usage.

From the three levels of design being observed, designer researchers are expected to have more control of visceral and behavioral reactions compared to reflective reactions. Visceral design is concerned with biological, automatic appraisal of the visual qualities of items that are concerned with the appearance of objects on the surface. Next, behavioral refers to the function and use of a product that is linked to learned behavior, albeit automatic over time. Meanwhile, at the highest level of Design is Reflective as it concerns intellectual functioning involving self-evaluation, self-awareness, consciousness and blame. This advanced level involves the emotional sensation of feelings from users' visceral and behavioral affective components.

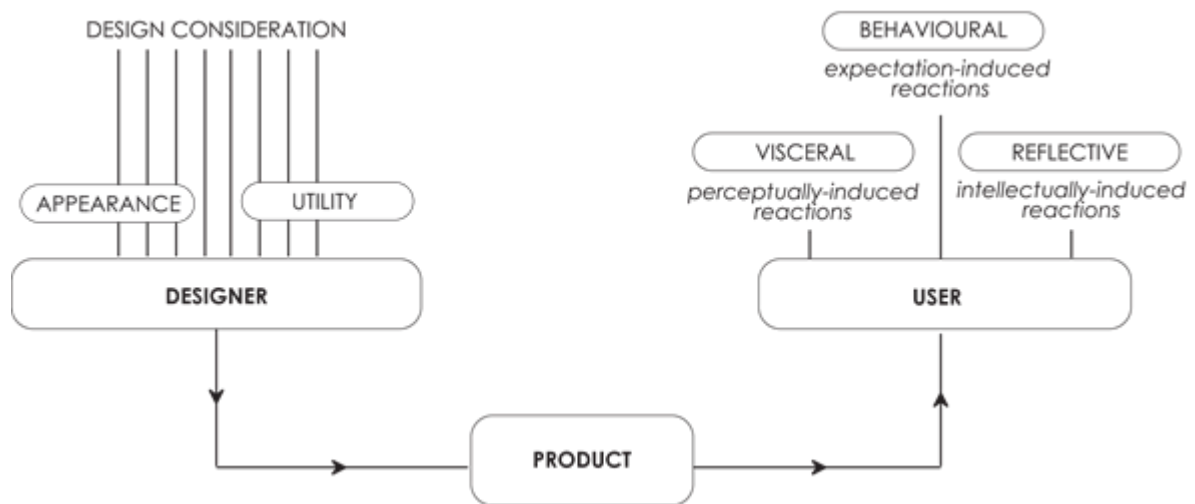


Figure 2: The Three Level of Design (Norman, 2003)

In Design research and practice, particularly involving products for autism therapy, the emotional affordances of products can influence the emotions of users. To establish a holistic understanding of users' affective on the product, the utility and appearance are significant. Here, an alternative therapy design can attempt to shape users' emotional responses by creating emotional affordances using identified utility and appearance attributes. As such, Figure 3 below depicts how the elements of the current study can be applied to the original model by Norman (2003) with Children with ASD set as the user and Furniture Design Concept as the product.

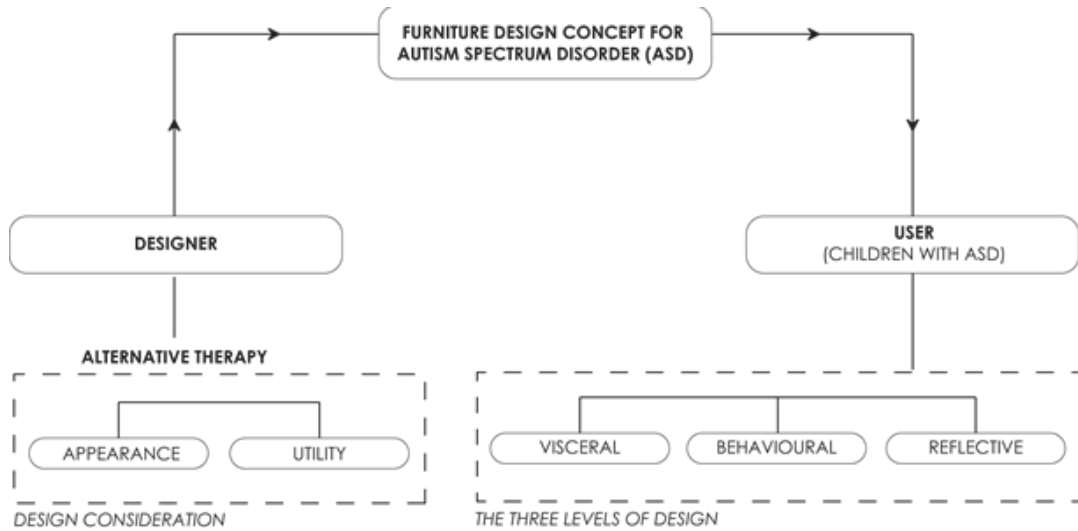


Figure 3: Furniture Design as Therapy Product Framework Adapted from the Three Level of Design Framework (Norman, 2003)

3.0 Results and Discussion

The analysis of preliminary data gathered will be used to guide in-depth interviews and observation later. The findings will inform concerns that need to be considered to further understand more about autistic children. Based on preliminary findings of the eight videos totaling 287 minutes of data, primary issues revolve around outbursts in two different settings, indoor and outdoor. Despite the two varied backgrounds, due to the nature of the instructional or demonstrative-type video, the environment was in a controlled setting conducted by the therapist under the supervision of a guardian. A common phenomenon of outbursts can be seen when children with ASD do not obtain what they desire or when their routine is disrupted. Some of the observation shows in detail the effectiveness of their sensory toys to help them regulate their outbursts. The detail in which the video can describe each sensory product is in-depth raw data suitable for analysis and coding. Along with that, each frame of in the video provides still imagery that can be further analyzed in context and coded based on the conceptual framework of the current study. Figure 4 provides a sample of the findings from the preliminary study.

VIDEO OBSERVATION 6

	A (ACTIVITIES)	E (ENVIRONMENT)	I (INFORMATION)	O (OBJECTS)	U (USER)
<p>PUNCHING BAG AND ROPES Provide stress relief and feedback to the journey.</p>	the child is punching the bag and playing with the ropes.	sensory room	able to get all the anger and frustration out for the child to calm themselves.	punching bag and the ropes	autistic child
<p>SWING Has a calming effect on the child without.</p>	the child is going back and forth on the swing.	sensory room	the other child can calm themselves through the movement like the swing.	swing	autistic child
<p>CRASH PAD Offers full-body tactile stimulation.</p>	the child is jumping onto the crash pad.	sensory room	crash pad is a safe space for the child that have sensory issues to crash into.	crash pad	autistic child
<p>SENSING Provides calm through pressure of touch.</p>	the children lay down on their stomach and the therapist will squished the ball on their back.	sensory room	provide calming for the children by the deep-pressure touch.	exercise ball	autistic child

Figure 4: Sample of Analysis and Coding on Still Images from Online Video Observation

The preliminary study has identified a basic premise for answering an important query of the study, which is the best approach for calming autistic children's outbursts. The initial result determines that sensory pleasure is the best method. It is discovered that by including sensory features into the furniture concept, children with ASD will be able to apply focus on enjoyment rather than their outbursts. From a visceral design level standpoint, an imagery of joy needs to be incorporated into the appearance consideration. Later, the appearance of joy will need to retain attention often enough that it will result in consistent behavior change. In this sense, the utility consideration will need to be met. Finally, on a visceral level, both the appearance and utility consideration combined will need to provide a 'sense of promise' to a Child with ASD, that the furniture brings solace and is 'the place' to manage tantrums. This will happen when the product reaches a visceral design level perception for the user.

Besides the overview of findings, smaller design consideration was also done with regards to the effectiveness of some therapeutic qualities of existing product utility which include that of a sandbox, stainless steel pin art, varied textures of sensory mats, and utility that encourages children to engage in active seated. Narrowing down these specific attributes, the next phases of the research can explore deeper into the effect and effect of such appearance and utility through in-depth interviews that will include co-creation sessions, to be tested later through controlled session observations.

In the preliminary study, it was also found that the best product that can help children with ASD enhance their abilities may also have the potential to enhance their ability to reduce their outbursts. This will be considered at a visceral level as it requires an active and conscious reflection by the children themselves. Narrowing down to enhance the ability to control oneself is a direction that is promising and is also widely supported by literature. Finally, another consideration that is equally important due to its universal nature is safety to be explored both from a product's quality (appearance) and function (utility).

5.0 Conclusion

The study's findings contributed to the body of knowledge on both a methodological and topic matter level. On one part, the practice of social sciences research methods can be combined with contemporary design methods strategically to bring out the best of each operation. Besides that, the philosophical assumption of this qualitative design application lies in the premise that the designer's perspective is equally important to the research. So, in dealing with a design-based inquiry, a preliminary study must be conducted to prime the designer-researcher into the subject matter before going more in-depth to collect data. This builds designers' intuitiveness and empathy towards the subject, both of which are crucial to any design-related output. The result of the preliminary findings is a coded list of visceral, behavioral and reflective design perceptions on existing therapy activities that can guide in-depth questions and co-creation exercises with the therapist and guardian. On top of that, the findings also provided an early set of appearance and utility considerations for prototype design that can be tested as part of the controlled observation sessions.

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