

EXPLORATION OF MONUMENTAL TEXTILE TECHNIQUES AS A SENSORY INTERVENTION MEDIUM FOR CHILDREN WITH SPECIAL NEEDS THROUGH A DESIGN THINKING APPROACH

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ABSTRACT

This study investigates the use of monumental textile techniques as a multisensory intervention medium for children with sensory processing disorders through a Design Thinking approach. Children with sensory challenges often display repetitive behaviors as self-regulation strategies due to difficulties in processing tactile and proprioceptive stimuli. Using qualitative methods including participatory observation, interviews, studio experiments, and limited trials involving three children aged 3 to 7 years, this research developed textile-based sensory media employing ruffling and tucking techniques. The findings show that varied textures effectively stimulate sensory responses, increase attention span, and promote positive emotional engagement. The intervention also redirects repetitive behaviors into more structured and adaptive exploratory activities. The Design Thinking approach ensures that the developed media are user-centered, functional, and contextually relevant. However, effectiveness depends on individual sensory profiles, requiring personalized implementation and professional supervision. Overall, monumental textile media demonstrate strong potential as innovative sensory intervention tools to support emotional regulation and adaptive behavior in children with special needs.

Keywords: sensory processing disorder; monumental textiles; multisensory intervention; design thinking;

A. INTRODUCTION

Children with special needs, particularly those with sensory processing disorders, often experience difficulties in organizing and responding to sensory stimuli in their daily activities. These challenges may manifest in the form of repetitive behaviors, limited attention span, and difficulties in engaging in structured learning environments. Sensory processing difficulties are closely related to how the nervous system receives, integrates, and responds to sensory input, especially tactile and proprioceptive stimuli (Schaaf & Lane, 2023). Recent studies have emphasized that atypical sensory processing is a core characteristic in many developmental conditions, influencing both behavioral regulation and emotional responses (Kim et al., 2025; Schaaf & Lane, 2023).

One of the most observable behaviors in children with sensory processing disorders is repetitive motor activity, such as squeezing, pulling, or manipulating objects. These behaviors are not merely maladaptive but can function as self-regulation strategies to achieve sensory balance (Badenoch et al., 2020).

Contemporary research further supports that repetitive behaviors are strongly associated with sensory modulation difficulties and serve as mechanisms to regulate internal sensory states (Cárcel-López & Ferrando-Prieto, 2025; Noda et al., 2024). Moreover, recent findings indicate that structured sensory interventions can significantly reduce maladaptive repetitive behaviors while improving adaptive functioning in children with developmental disorders (Baranek et al., 2023).

In recent years, there has been growing interest in the use of sensory-based media to support children's development. Tactile-based interventions, in particular, have been found to improve emotional regulation, attention, and engagement in children with sensory challenges (Liu, 2025). Materials that provide varied textures and allow active manipulation are considered effective in stimulating the tactile system and promoting adaptive responses (Hong, 2018). Additionally, multisensory learning approaches have been shown to enhance cognitive engagement and sensory integration by activating multiple sensory pathways simultaneously

(Shams & Seitz, 2023). However, many existing interventions rely on small-scale or isolated sensory tools, which may limit children's engagement and exploration.

To address this limitation, this study proposes the use of monumental textile techniques as a multisensory intervention medium. Monumental textiles, characterized by large-scale, textured, and interactive surfaces, offer a richer sensory experience by integrating tactile, visual, and proprioceptive stimulation simultaneously. The use of techniques such as ruffling and tucking creates dynamic textures that invite active exploration and manipulation, thereby supporting sensory regulation and motor engagement.

Furthermore, this study adopts a Design Thinking approach, which emphasizes user-centered problem solving through stages of empathizing, defining, ideating, prototyping, and testing. This approach ensures that the developed intervention media are not only theoretically grounded but also aligned with the real needs and experiences of children with sensory processing disorders. Recent research highlights that design

thinking in educational interventions can enhance creativity, usability, and user engagement, particularly in inclusive learning environments (Henriksen et al., 2024). By integrating artistic textile techniques with therapeutic principles, this research aims to develop an innovative, practical, and contextually relevant sensory intervention.

B. METHOD

1. Data Collection Techniques

a. Participatory Observation

Participatory observations were conducted during therapy sessions at the Bloom Child Development Center. These observations aimed to identify the fine motor abilities, behavioral characteristics, and sensory needs of children aged 3 to 7 years. In addition, the observations examined children's developmental progress following sensory integration therapy and their responses to tactile stimuli, particularly those involving textile-based materials.

b. Semi-Structured Interviews

Semi-structured interviews were conducted with three key informants,

including a therapist, a special education teacher, and parents of the participating children. These interviews aimed to obtain in-depth information regarding the children's sensory profiles, learning strategies implemented in therapy and educational settings, and family experiences in supporting daily activities.

c. Studio Experiments

A series of studio-based experiments were carried out to explore appropriate textile materials, techniques, and visual elements such as color and texture that could effectively stimulate children's sensory systems. The experimental process was conducted iteratively to develop a prototype referred to as "montex" (monumental textile), ensuring its relevance and feasibility as a sensory intervention medium.

d. Limited Testing

The developed prototypes were evaluated through limited trials involving the participating children under the supervision of a professional therapist. This stage aimed to assess the safety and effectiveness of the sensory stimulation provided. Children's

interactions and responses to the textile media were observed and qualitatively analyzed to evaluate the functionality and impact of the intervention.

2. Research Subjects

The study involved three children aged 3 to 7 years who were identified as having sensory processing disorders based on parental reports and professional assessments from therapists. Participants were selected using purposive sampling to ensure alignment between the research objectives and the characteristics of the subjects.

3. Research Location and Duration

The research was conducted at two locations, namely the Fashion Design Laboratory and the Bloom Child Development Center in Bekasi. The study was carried out over a period of approximately two months.

C. RESULTS AND DISCUSSION

Observation results from the field during the empathize phase indicate that children with sensory processing disorders exhibit varied responses to textural stimuli. Some

children showed a strong interest in certain textures, while in other cases, repetitive behaviors such as repeatedly squeezing, pulling, and twisting fabric were observed. This behavior indicates underexpressed sensory needs, particularly within the tactile and proprioceptive systems. In Sensory Integration studies, this phenomenon is understood as a form of self-regulation, in which the child attempts to stabilize their nervous system's response through repeated sensory stimulation. As mentioned by A. Jean Ayres (1972), children with sensory processing disorders tend to exhibit sensory-seeking behavior as an effort to achieve a more adaptive response organization. These findings are further supported by recent research showing that repetitive behaviors in children with developmental disorders often serve as a mechanism for regulating sensory stimulation levels and achieving internal sensory balance (Maria and Mercedes, 2025).

These findings are supported by observations that all study participants expressed a high need for tactile exploration involving distinct and varied textures. The children

showed more positive emotional responses, such as being calmer and more focused when interacting with textile materials compared to other stimuli. From the perspective of the sensory processing model developed by Winnie Dunn, this indicates that the child falls into the high-threshold category, thus requiring greater intensity and variety of stimuli to elicit an adaptive response. This aligns with recent neuropsychological findings stating that individuals with tactile hyposensitivity tend to seek additional stimulation through repetitive touch or object manipulation (Kim et al., 2025). Therefore, behaviors such as twisting textiles can be understood as a compensatory strategy for a lack of appropriate sensory input.

In the defined phase, the child's primary needs were identified as requiring sensory materials that are safe, feature varied textures, are easy to work with, and are visually exciting. These needs directly correlate with the child's behavioral characteristics, which involve a tendency to explore objects through repeated touch. Thus, the development of texture-based materials serves not only as stimulation but also as a means of

redirecting repetitive behavior into more purposeful and functional activities. The literature indicates that providing specially designed tactile materials can help children in interpreting tactile stimuli and produce more adaptive behavioral responses (Karen Hong, 2018).

The ideation phase generates several media alternatives, such as interactive textured carpets, textile curtains, and textile murals. The selection of the final product, a multifunctional lunch bag based on monumental textiles, is the result of balancing practical functionality with therapeutic value. The use of monumental textile (monteks) techniques, particularly ruffles and tucking, provides a rich, manipulative texture that is responsive to children's touch. In this context, textiles serve not only as aesthetic elements but also as a multisensory stimulation medium integrated into children's daily activities. This is supported by recent research indicating that three-dimensional textile-based media can serve as effective tactile therapy tools for enhancing sensory regulation and children's engagement in activities (Karen Hong, 2018).

During the prototype phase, the researchers developed three medium-sized textile panels using various ruffle and tucking techniques. The textile panels were designed using contrasting colors such as red, yellow, and blue to provide strong stimulation through visual cues. In selecting materials, the researchers chose fabrics that feel soft to touch with diverse surface textures. As a result, these products successfully increased children's interest in interacting with them. Children not only touched the fabric but also pulled, pressed, and squeezed it, indirectly stimulating their proprioceptive system. These activities provided more organized sensory input compared to the repetitive and less directed behavior of twisting the fabric. In neurobehavioral studies, sensory-based manipulative activities are known to redirect internal impulses which previously manifested as repetitive behaviors into more adaptive exploratory activities (James Badenoch, 2020).

The following is one of the stages in the process of creating intervention media from monumental textiles:

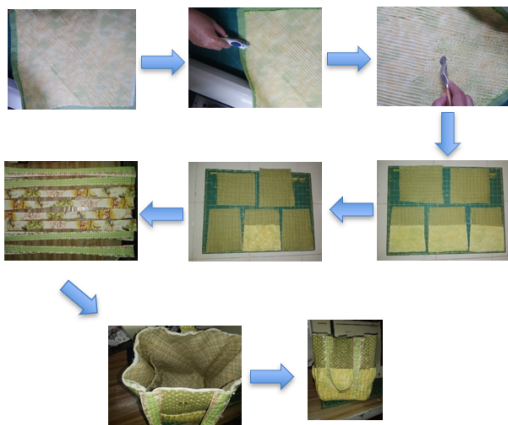


Figure 1. The process of creating intervention media from monumental textiles

Results from the preliminary testing phase showed an increase in the duration of the child's attention toward the object, from an average of 5 minutes to 12 minutes in one subject. Additionally, the child displayed positive emotional expressions such as smiling and laughing during the interaction. These findings indicate that texture-based activities can provide a more optimal sensory regulation effect. Recent research also shows that providing tactile stimulation through sensory media such as fidget toys or manipulative objects can help with emotional regulation and improve focus in children with special needs (Yuqi Liu, 2025).

The following are photos of intervention media products made from monumental textiles:



Figure 2. The intervention media products

Theoretically, monumental textural activities offer an advantage because they provide a broader and more engaging multisensory experience. Exploring texture on a large scale allows for the concurrent integration of the tactile, proprioceptive, and visual systems. The variety of sensations produced by ruffling and tucking techniques such as fabric waves, folds, and pressure upon being touched can support the development of children's sensory discrimination skills. This is consistent with findings that impairments in the tactile system can affect an individual's ability to recognize and organize sensory information, as well as to perform daily activities in a structured manner (Kim et al., 2025).

These activities also contribute to emotional regulation and

engagement. The positive responses children demonstrate during interactions indicate a calming effect, which, in a neuropsychological context, is linked to the fulfillment of internal sensory needs. Recent studies show that repetitive behaviors and sensory responses are closely linked to the emotional regulation system and can be modified through appropriate sensory interventions (Haruka Noda, 2024). Thus, monumental textile media not only function as tools for sensory stimulation but also as a means to support emotional stability and improve children's focus during therapeutic and learning activities.

The results of this study align with the findings of Yasmin & Mayar (2023), who state that art-based activities can enhance children's fine motor skills and creativity. In a more specific context, this study demonstrates that exploring textures through textile-based activities also plays a role in redirecting repetitive sensory behaviors, such as twisting textiles into more structured, meaningful, and adaptive activities.

Nevertheless, this study also found that the effectiveness of the

intervention is highly dependent on its alignment with each child's sensory profile. Children with hypersensitive tendencies require a step-by-step approach to avoid overstimulation. Therefore, the principles of individualized intervention and the involvement of therapy professionals remain critical factors in the implementation of this media.

Overall, the study results indicate that the textile-based technique holds strong potential as an innovative, contextual, and practical sensory intervention media. A Design Thinking-based approach enables the development of solutions that are not only product-oriented but also user-experience-oriented, thereby addressing the real needs of children with sensory processing disorders.

D. CONCLUSION

This study demonstrates that children with sensory processing disorders have distinct sensory needs, particularly in the tactile and proprioceptive domains, which are often expressed through repetitive behaviors as forms of self-regulation. The findings indicate that these

behaviors can be redirected into more adaptive and functional activities through structured and appropriate sensory stimulation. The application of monumental textile techniques, particularly ruffling and tucking, provides rich multisensory experiences that enhance engagement, increase attention span, and promote positive emotional responses. The integration of tactile, visual, and proprioceptive elements enables the transformation of repetitive behaviors into meaningful exploratory activities. Furthermore, the Design Thinking approach supports the development of user-centered and contextually relevant intervention media that are both functional and applicable in daily contexts. However, the effectiveness of the intervention is influenced by individual sensory profiles, highlighting the need for personalized strategies, gradual implementation, and professional supervision. Overall, monumental textile-based media offer strong potential as innovative and inclusive sensory intervention tools to support emotional regulation, adaptive behavior, and meaningful participation in children with sensory processing disorders.

REFERENCES

- Ayres, A. J. (1972). *Sensory integration and learning disorders*. Western Psychological Services.
- Badenoch, J., Cavanna, A. E., & Joyce, E. (2020). Sensory symptoms in body-focused repetitive behaviors. *Neuroscience & Biobehavioral Reviews*, *113*, 202–214. <https://doi.org/10.1016/j.neubiorev.2020.03.021>
- Baranek, G. T., Watson, L. R., Boyd, B. A., et al. (2023). Sensory features and intervention outcomes in children with developmental disorders. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-023-05812-7>
- Cárcel-López, M. D., & Ferrando-Prieto, M. (2025). Differences and Relationships Between Sensory Profile and Repetitive Behavior in Autism. *Children (Basel, Switzerland)*, *12*(4), 504. <https://doi.org/10.3390/children12040504>
- Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and their families. *Infants & Young Children*, *9*(4), 23–35.
- Hong, K. (2018). *Tactile toys: Therapy for tactile dysfunctions*. *International Journal of*

Technology and Inclusive Education, 7(2), 1295–1303.

education.Nature Reviews Psychology.<https://doi.org/10.1038/s44159-023-00188-0>

Kim, T., Lee, J., Lee, J. *et al.* Sensory abnormalities in autism spectrum disorder and their in vitro modeling. *Transl Psychiatry* 15, 534 (2025).
<https://doi.org/10.1038/s41398-025-03778-6>

Liu, Yuqi. (2025). The Rise of Sensory Fidget Toys: Origins, Psychological Principles, and Their Role in Stress Relief and Mental Health. SHS Web of Conferences. 213. 02027. DOI:[10.1051/shsconf/202521302027](https://doi.org/10.1051/shsconf/202521302027)

Noda H, Yoneda N, Kamogawa K, Tanaka G, Ide M and Iwanaga R (2024) Sensory processing associated with subcategories of restricted and repetitive behaviors in Japanese children and adolescents with autism spectrum disorder. *Front. Child Adolesc. Psychiatry* 3:1411445. DOI:
<https://doi.org/10.3389/frcha.2024.1411445>

Schaaf, R. C., & Lane, A. E. (2023). Toward a best-practice protocol for sensory integration interventions. *American Journal of Occupational Therapy*.<https://doi.org/10.5014/ajot.2023.050123>

Shams, L., & Seitz, A. R. (2023). Multisensory learning and integration: Implications for