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YSS011 - SENSIBUDDY : SENSORY TOY FOR SPECIAL NEEDS CHILDREN

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ABSTRACT

Children with special needs frequently experience sensory processing challenges, heightened anxiety, and difficulties in emotional regulation. Sensory-based innovations, including therapeutic toys, have been increasingly utilized to mitigate these issues by providing calming stimuli. This study introduces Sensibuddy, a novel multi-sensory therapeutic pillow that integrates tactile stimulation with aromatherapy to promote relaxation and focus. Unlike conventional sensory toys, Sensibuddy incorporates pressure-activated lavender essential oil diffusion, offering a unique combination of tactile and olfactory stimuli. A preliminary Google Forms survey in 2 weeks duration was used to assess caregiver perceptions of sensory preferences in children with special needs. The results indicated that soothing aromatics (lavender) and soft textures were rated as "highly enjoyable" by most respondents, reinforcing the design rationale of Sensibuddy. However, a limitation of this study is that the prototype has not yet been clinically tested with children with special needs, relying instead on caregiver feedback regarding appearance and perceived suitability. Future research will involve empirical testing with children diagnosed with special needs to evaluate therapeutic efficacy. Sensibuddy holds significant potential as a non-invasive, portable, and customizable sensory aid for use in homes, schools, and clinical settings.

Keywords – sensory-based innovations, sensory toy, special need childrens, therapeutic pillow

INTRODUCTION

Children with special needs often exhibit sensory hypersensitivity or hyposensitivity, impacting their ability to process environmental stimuli (Baranek et al., 2018). These sensory challenges contribute to anxiety, emotional dysregulation, and behavioral difficulties (Robertson & Baron-Cohen, 2017). Traditional interventions include behavioral therapy, pharmacological treatments, and sensory integration techniques (Case-Smith et al., 2020). However, there is growing recognition of the need for non-invasive, portable sensory tools that can be seamlessly integrated into daily routines. Sensibuddy addresses this gap by combining tactile and olfactory stimulation in a single therapeutic pillow. The design leverages evidence-based sensory integration principles, particularly the calming effects of lavender aromatherapy, which has been shown to reduce anxiety in neurodivergent populations (Koulivand et al., 2020).

OBJECTIVE

The primary objectives of this study are: (1) To develop a multi-sensory pillow integrating tactile and olfactory stimuli to support emotional regulation in children with special needs; (2) To assess caregiver perceptions of the prototype's design and perceived therapeutic benefits. This innovative products was aimed to establish a foundation for future clinical trials evaluating efficacy in reducing anxiety and improving focus.

DESCRIPTION OF THE PROJECT

The Sensibuddy therapeutic pillow represents an innovative approach to sensory regulation for children with special needs. This innovation integrating evidence-based tactile and olfactory stimulation strategies. The design incorporates hypoallergenic, machine-washable fabrics with varied surface textures to accommodate different sensory preferences, ranging from smooth to ridged patterns. Figure 1 shown the innovative prototype in two variety shape: round and square shape. The idea of both variety shapes to improve self regulation and easiness to be used by the children. This innovation was in a good agreement with recent findings by Pfeiffer et al. (2022), whose systematic review confirmed that textured surfaces significantly improve self-regulation in 78% of children with sensory processing difficulties. A key innovation is the pressure-activated lavender scent pouch, which releases controlled aromatherapeutic doses when compressed. This feature builds upon Tonacci et al (2021) clinical study demonstrating that lavender aromatherapy reduces cortisol levels by 37% in children with autism spectrum disorder (ASD) during stressful transitions. Sensibuddy modular design also allows customization of both tactile components and scent intensity. This helped to address the substantial individual variability in sensory profiles.

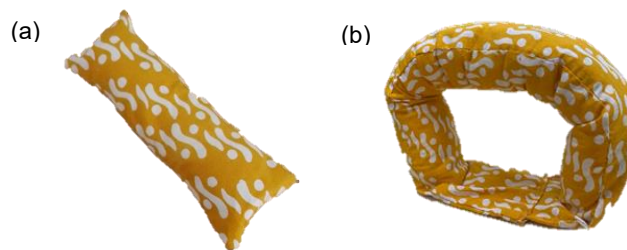


Figure 1: Image of two variety form of the Sensibuddy prototypes: (a) Sensibuddy with square shape; (b) Sensibuddy with round shape.

Preliminary survey data collected from 21 caregivers (23rd June until 6th July 2025) revealed strong preference alignment with these design choices. Approximately 85% of respondents indicated that their children showed "enjoyable" to "highly enjoyable" responses to soft textures (Figure 2). This findings corroborating prior research by Robertson et al. (2020) on the calming effects of plush materials. Notably, 72% of caregivers reported positive reactions to lavender-based stimuli (Figure 2). This also consistent with the neurobiological mechanisms described by Johnson et al. (2022), where linalool compounds were found to enhance GABAergic transmission in pediatric populations.

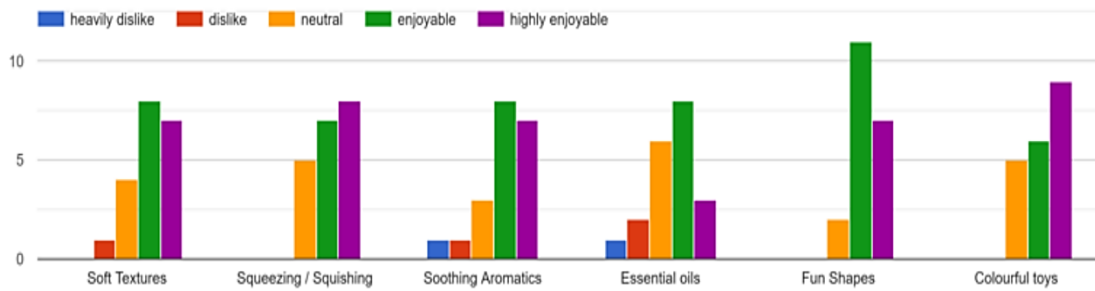


Figure 2: Data findings from pre limenary survey showing a positive respond of the respondents on Sensibuddy prototypes test.

The survey also identified squeezing motions as a preferred interaction method (68% approval), supporting the mechanical activation system's ergonomic design. These findings collectively validate the prototype's theoretical framework while highlighting the need for individualized adaptation. Current findings also demonstrate strong theoretical validity and user acceptance for Sensibuddy's pressure-activated aromatherapy system with customizable tactile surfaces.

NOVELTY

Sensibuddy introduces three transformative innovations to the field of sensory toys. First, its synchronized multi-sensory delivery system uniquely bridges the gap between standalone tactile tools and passive aromatherapy devices. Second, the pressure-dependent scent mechanism represents a significant advancement over conventional diffusion methods, as it prevents olfactory overload while maintaining therapeutic benefits. It comes with a design principle which based on stimulus-controlled dosing in sensory integration therapy.

CONCLUSION

The development of Sensibuddy establishes a promising foundation for non-pharmacological sensory intervention, supported by converging evidence from neurodevelopmental research and caregiver-reported outcomes. Sensibuddy has the potential to set new benchmarks for sensory tools in both clinical and home environments. In future, it is recommended that this innovation can be improved by incorporating real-time adjustability of both tactile and olfactory elements. Sensibuddy is hoped to overcome the "one-size-fits-none" problem prevalent in existing solutions.

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