International Journal of Applied Home Science
(An International Double Blind Peer Reviewed / Refereed Research Journal of Home Science)
Volume 11 (3 & 4), March & April (2024) : 105-109
Received : 22.02.2024; Revised : 07.03.2024; Accepted : 22.03.2024

RESEARCH PAPER
ISSN : 2394-1413
DOI: 10.36537/IJAHS/11.3&4/105-109

Sensory based Adaptive Functional Clothing for Children having Autism Spectrum Disorder

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ABSTRACT

Children having Autism are more sensitive to the physical surroundings than the average person, due to which they are often overwhelmed by the environment. This is primarily due to sensory processing deficits which creates challenge in understanding and adapting to the environment resulting in anxiety. Autistic children belong to a sect of the population that is usually ignored in design specially to prepare them for the challenges and problems they will face in everyday life. In recent years, with evolutionary segment of technical textiles market, clothing has crossed conventional boundaries to integrate various domains like medicine, biotechnology, nanotechnology etc. with design. Functional clothing is one such representative that promotes clothing for special needs.In this research paper, the integration of functional clothing with sensory design, both visual and tactile, is shown which enable Autistic children to cope and adapt to change efficiently. The research identifies limited design considerations given to children having Autism spectrum disorder and awakens the trance need of sensory textiles in functional clothing facilitating the Autistic children.

Key Words : Autism Spectrum Disorder, Functional clothing, Sensory mechanism in textiles

INTRODUCTION

Autism spectrum disorder (ASD) is a term used to describe a group of conditions characterised by difficulties with social skills, repetitive activities, speech and nonverbal communication, and difficulties with unique strengths and characteristics (Yates, 2016). ASD is a spectrum condition because children might experience a wide variety of symptoms or features ranging from mild to severe (Willis, 2006). ASD is characterised by delays in communication and social interaction, obsessions with specific items, repetitive bodily motions, and specialised routines and rituals they obsessively follow (Kommu, 2011). Autism symptoms typically occur between the ages of two and three (Wright and Wright, 2005). It can be identified as early as 18 months in some situations (Perrin *et al.*, 2012).

Autism Spectrum Disorder is a very complex disorder due to its characteristics as well as its type. Autism Spectrum Disorder is classified into four types: Pervasive Developmental Disorder Not Otherwise Specified (PDDNOS) is a kind of autism in which the child's characteristics differ from those of other autistic children and is usually diagnosed after the age of three. Asperger's Syndrome is a type in which children learn how to socialise and communicate as adolescents but have difficulty with co-ordination, vocal tone, depression, violent reaction to change, and a proclivity for ritualistic behaviour (Mikami and Matsumoto, 2007). Rett's Syndrome is a unique neurodevelopmental disorder that is first noticed in infancy and primarily affects girls (Anonymous, 2010) and Childhood Disintegrative Disorder (CDD), which is characterised by mental function disintegration and regression of acquired language and intellectual function following a period of normal development (Verma and Mohapatra, 2016).

How to cite this Article: Saikia, Tulika and Mukherjee, Sandip (2024). Sensory based Adaptive Functional Clothing for Children having Autism Spectrum Disorder. *Internat. J. Appl. Home Sci.,* **11** (3 & 4) : 105-109.

Autistic Children and Sensory Processing:

Children with Autism Spectrum Disorder have unusual sensory reactions ranging from hyper-responsiveness to hypo-responsiveness (Kyriacou *et al.*, 2021), which interferes with their daily life. Hyper-responsiveness refers to the sensory channel being too open, allowing too much stimulus into the brain, whereas hypo-responsiveness refers to the sensory channel being too closed, allowing too little stimulation into the brain and depriving it of sensory input (Ghazali *et al.*, 2018). Since autistic children are more sensitive to their physical environment, they react to sensory inputs with conduct that is not proportional to the degree and kind of the sensory stimulation. When an autistic child is unable to comprehend or adjust to their surroundings, bad behaviour ensues, resulting in significant levels of anxiety. As a result, autistic people may exhibit sensory soothing behaviours that serve to repeat or strengthen sensory experiences. Sensory soothing conduct necessitates powerful sensory inputs in order to elicit a soothing reaction. Significant variances in a variety of input modalities such as gustatory, olfactory, auditory, visual, and tactile have been discovered in Autistic Children, implying that a "one size fits all" approach to design is not appropriate for every Autistic Child.

Touch and sight are two of the senses that are heavily focused on in order to enhance the sensory experience in functional clothing. This study is based on earlier research in which Autistic hyposensitivity or hypersensitivity is used as the foundation for design inclusion (Seyedi, 2019). Colour has been emphasised in the design's visual component, with brighter colours being more disruptive to hypersensitive individuals than muted colours, and vice versa for hyposensitive individuals (Gaines *et al.*, 2016). Differences in materials and surfaces can have a substantial impact on Autistic children's sensation of touch. They find soft natural textures more soothing and delightful. Multisensory textiles provide key properties in meeting the needs of autistic individuals, allowing them to enjoy tactile interactions and alleviate behavioural disorders such as anxiety (Ahlquist, 2015). Textile designer Ellie Turner creates relief textured textures that portray Autistic children's body connections with materials and things and relate to their visual relationship (Fig. 1).

Children with Autism are extremely sensitive about their attire and overall appearance (Kyriacou *et al.*, 2021). Wearing the appropriate clothing is linked to the

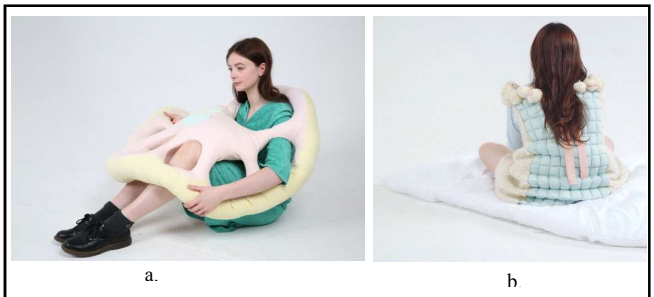


Fig. 1 : Sensory product design by Ellie Turner: a. Interaction with the lifestyle product based on surface and the form, and b. tactile interaction in garment

Autistic individual's emotions and moods. Their enjoyment experience is determined by the tactile experience of the fabric. A negative encounter with cloth texture causes stress, anxiety, and disorientation. As a result, design considerations for assimilation of practical clothing with sensory-based experiences would include adaptive features relating to modified body form, strength and movement limitations, as well as psychological and social needs. Texture placement in various portions of functional clothing will provide simple access to the Autistic child in cases of tactile hyper-responsiveness, which they frequently experience, and can be employed as relaxing tactics once the texture is perceived to be pleasurable (Smith and Sharp, 2012). Choosing appropriate clothing and repeatedly touching or stroking a specific texture of a fabric is a common strategy for some Autistic individuals to experience soothing sensory experiences (Ashburner and Rodger, 2013) and as a coping mechanism to reduce stress and increase well-being (Jones *et al.*, 2003).

METHODOLOGY

The research paper is an exploratory study that aided in getting insights into the sensory experience of clothing on Autistic children, ultimately leading to an acceptable approach to design development. Based on secondary research, Interpretative phenomenological analysis is used to investigate design features that can be included in functional apparel to improve sensory experience. Instead of other qualitative methodologies, interpretative phenomenological analysis was chosen since it helps to focus on the expressed experiences of persons of specific social phenomena, in this case tactile sensation of Autistic children in clothing.

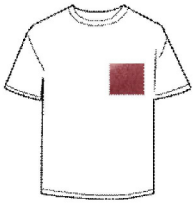
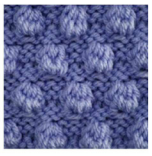
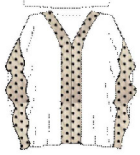
RESULTS AND DISCUSSION

The current research explores the possibility of combining sensory textile with functional clothing, a relatively new and exciting segment of the technical textile group that can be defined as a generic term including all types of clothing or assemblies that are specifically engineered to deliver a predefined performance or functionlity to the user, in addition to its normal function (Gupta, 2011). The functional clothing assemblies are ergonomically designed to have a minimal inhibiting influence on mobility while providing the user with optimal comfort and performance.

Individuals learn to adapt and experience their surroundings by using all of their senses, including smell, sight, taste, sound, and touch. This capacity is known as sensory integration, and it is critical for developing a cohesive perspective of a situation and deciding how to act. Touch impairment is more common in autistic children than in other sensory modalities. Many children with Autistic Spectrum Disorder have an extraordinary fear of being touched, which might come from wearing garments or from tags and labels on clothing. When autistic children are exposed to some unpleasant stimuli, they experience emotional pain and worry. Tactile modality, on the other hand, is most typically observed to provide pleasurable experiences when it is thought to be more controllable.

Phenomenology, Hermeneutics, and Idiography are three philosophical approaches to interpretative phenomenological analysis. Phenology is a philosophical approach to comprehend people's subjective experiences (Smith *et al.*, 2009). Hermeneutics refers to the active

Table 1: Design directions in Functional clothing for Sensory Experience

Sr. No.	Functional clothing	Textured Fabric Sample	Design description	Purpose
1.		 Velour Knitted fabric	Knitted Velour fabric has been used in the patch pocket of the round neck Lyocell Tee-shirt	The Pocket detail enables tactile experience to the autistic child where the softer surface of the patch pocket helps in reducing anxiety
2.		 Floral Pompom	Pompom structure has been used at the hem of the elasticated linen palazzo	Constant stroking of the surface of the pompom helps calming the autistic child during stress
3.		 Knitted Bubble structure	Bubble knitted structure is placed in the raglan sleeves of the round neck cotton tee shirt	The tactile experience of the bubble helps in generating sensory soothing behaviour to the autistic child
4.		 Flock Print	Flock print is placed in the centre panel and sleeve panel of the Modal kaftan	The softer surface of the flock print gives pleasurable sensory experience to the autistic child
5.		 Puff Binder Printing	The Puff binder is placed in the centre panel of the cotton trapeze dress	The softer surface of the Puff binder print helps in evoking tranquillity

relationship between the researchers' interpretation of the participants' experiences and their own personal view of the findings. Idiography refers to the researcher's commitment to collect in-depth data in order to understand these events from the participants' point of view. It is impossible to fully comprehend the complex neurological disease known as autism spectrum disorder.Each autistic child has unique needs that differ from those of regular children. The quality of life for these populations can be greatly enhanced by wearing clothing that is attractive, comfortable, and feels good. By including emotive consideration, the functional clothing design has the potential to provide tactile and sensory features for autistic consumers, which could promote social inclusion and improved adaption for autistic children.

Based on these approaches the following suggestive measures have been taken in connection to the design development along with the detailing and speciality fabric selection for the purpose to meet the functional requirement as well as sensory experience through tactation as shown in Table 1.

Conclusion :

Children with autism have a lifelong condition that impacts their capacity to communicate, interact with others, and control their behaviours. Since they are more physically sensitive than the ordinary person, they frequently feel overwhelmed by their surroundings which is mostly caused by sensory processing issues, thus making it difficult to understand and adjust to the surroundings and cause anxiety. In the present research, integration of functional clothing with sensory design has been shown through different design directions by incorporating speciality fabrics in forms of patch pockets, raglan sleeves, hem, centre panels etc. These placement of textured surface in the form of design detailing on the garments allows the autistic child to have easy access to tactile sensory experience which enable them to cope and adapt to change efficiently. The research highlights limited design considerations given to children with Autism Spectrum Disorder and awakens the trance need of functional ned as well as sensory experience through tactation, thereby aiding Autistic children and building a platform for design addressing disability.

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