

SENSORY REPAIR

CRAFTING INCLUSION THROUGH DESIGNING WITH THE SENSES

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Abstract

This paper explores clothing as a multidimensional sensory experience and examines how fashion might better support neurodivergent individuals, a group who often experience heightened sensory interactions with the environment. In current fashion practices, the visual design of clothing is typically prioritised, often overlooking the needs of those who prioritise non-visual senses. Neurodivergent wearers may find certain design elements, like garment labels or fabric textures, impactful to their comfort and subsequent wellbeing. This research investigates the intersection of fashion, neurodivergent experience, and the senses. Using participatory design methods, this paper illuminates strategies to create garments that support neurodivergent needs, advocating for an approach that prioritises the wearers wellbeing through non-visual, sensory experiences in fashion.

Keywords: *Inclusive Fashion; Sensory Fashion; Participatory Design; Fashion Design*

INTRODUCTION

Wearing clothing is a multisensory experience (Chong Kwan, 2020). For instance, a jumper provides a proprioceptive weight on the body, envelopes with texture, carries a smell after washing, and, of course, visually impacts us. These sensory experiences—touch, smell, sight, and more—define how we interact with clothing daily (Lavery, 2021). While many people primarily experience clothing visually, some, particularly neurodivergent individuals, may find that tactile, auditory, olfactory or other sensory aspects have a stronger influence on their experience. For example, the noise of certain fabrics rubbing, or a particular texture, might be uncomfortable for neurodivergent wearers, leading to distraction,

stress, or confusion (Kyriacou et al., 2021).

Generally, there are limited considerations of the multi-sensory experience of wearing clothing. This visual approach overlooks a substantial population who might benefit from more sensory-aware design practices. Neurodivergent is a term generally used to describe individuals whose neurological functioning differs from what is typically considered neurotypical, for example, individuals with ADHD and autistic individuals. For neurodivergent individuals, neurological functioning can affect sensory processing, which in turn can influence how they experience and interact with the environment. This sensory processing can make everyday sensory stimuli—for instance loud city sounds, as in the case of

one autistic mental health counsellor I spoke to—overwhelming. In the context of clothing, similar sensitivity applies: fabrics that feel soft to some may be unbearable to those with heightened tactile awareness, and certain textures or sounds can cause extreme discomfort (Kyriacou et al., 2021). The connection between wellbeing and the senses is significant when designing for neurodivergent users. By exploring clothing as a means of creating a sensory-friendly environment, designers can transform clothing into a tool that actively supports neurodivergent wellbeing.

Inclusive design aims to be usable for as many people as possible, with particular attention to groups who have often been overlooked or excluded in mainstream design practices. Additionally, inclusive design methods have often been approached as problems to be solved (Pullin, 2009). This research instead responds to; *how do individuals foster a sensory experience through materials and trims? What are participants' approaches through exploration and curiosity rather than designing a 'solution'?* This work with individuals hopes to shed light on if there is continuity in how a range of participants create similar sensory experiences. The goal of this research is to contribute towards a shift of clothing as a form of design that actively supports wellbeing (Gaudion, 2014).

As addressed by Temple Grandin “So many professionals and nonprofessionals have ignored sensory issues because some people just can't imagine that an alternate sensory reality exists if they have not experienced it personally... That type of narrow perception, however, does nothing to help individuals who do have these very real issues in their lives” (Grandin, 2008, p. 58). This research seeks to promote understanding into a diverse range of sensory experiences, acknowledge a range of sensory experiences and to be informed directly by those with a sensory experience that is often seen as “different”.

Additionally, the use of language throughout this paper uses neurodivergent to refer to the participants worked with, with the majority favouring this term and identifying as neurodivergent. This choice of language does not reflect the greater preferences as part of the neurodivergent community. Additionally, neurotypical is used to refer to non-neurodivergent individuals, though it does not condone what is seen as ‘typical’.

THEORETICAL BACKGROUND

The term neurodivergent was originally used to describe autistic individuals but has now broadened to include ADHD, Dyslexia, Tourette's, and Dyspraxia (Gaudion & Phillips, 2024). Approximately 1 in 7 people are neurodivergent (“Support for neurodiversity”, 2024), with over 1 in 100 individuals diagnosed as autistic (Milton, 2012). The wellbeing of neurodivergent individuals, especially within the autistic community, is markedly lower than in neurotypical populations. For instance, autistic individuals are four times more likely to experience depression than non-autistic people (Hudson et al., 2019). This disparity highlights the pressing need for greater understanding and support for neurodivergent individuals across various aspects of daily life. While clothing design may not directly prevent depression, for example, the sensory interactions inherent to design can influence wellbeing and impact individuals over time.

Sensory preferences vary between people. Some individuals may seek certain types of sensory input, while others may avoid particular sensory experiences, with a wide range of variation in how these preferences are expressed. For example, weighted blankets are commonly used to provide proprioceptive feedback, helping to calm the nervous system for individuals who prefer this type of sensory input. Conversely, earplugs are generally used to minimise or control auditory stimuli. Such tools provide ways for individuals to manage their sensory environment, which can be a critical factor in daily wellbeing. Sensory management and coping strategies are used by many neurodivergent individuals as a form of control over incoming sensory stimuli and can be pivotal for everyday life (Kyriacou et al., 2021). Extended or intense sensory input can have an impact on individuals, leading to raised stress (Bogdashina, 2016) as well as be confusing and painful (Caldwell, 2011). Similarly to Gaudion's research on designers needing to further understand the sensory qualities of the environment (Gaudion, 2014), this research aims to foster an understanding of the sensory qualities of clothing for fashion designers.

Historically, autistic individuals have often been positioned as subjects of research rather than as researchers (Milton, 2019). Although roles for neurodivergent individuals in research are expanding, there is still a significant need for studies that are led and shaped by neurodiver-

gent individuals. The political principle of ‘nothing about us, without us’ emphasizes that autistic people should be actively involved whenever autism is discussed, an approach this research seeks to support and promote.

PARTICIPATORY DESIGN METHODS

To investigate the clothing-focused sensory priorities of neurodivergent individuals, participatory design methods were utilised. Participants, neurodivergent artists and designers across Amsterdam, Rotterdam, and The Hague, were invited to participatory design workshops. In these intimate settings (ranging from one-on-one to groups of six), participants were asked to create low-fidelity prototypes that explored how clothing might better support their sensory needs. Participants worked with a small variety of materials and trims, synonymous with dress-making, modifying existing garments or creating prototypes to physically communicate their preferences. These workshops were followed by the creation of subsequent high-fidelity prototypes, made by myself, the designs of which followed the participants’ creations. Participants tested these high-fidelity prototypes in real-life contexts to gain insight into the garments’ impact and effectiveness.

Participants were not asked to identify a ‘problem’ to be ‘solved’ through design. In this context, asking participants to identify a ‘problem’ felt both unnecessary and counterproductive, as it seemed to imply that the designer viewed neurodivergent experiences or behaviours as issues to be fixed or avoided. Instead, participants were encouraged to follow their sensory curiosities, using their tacit knowledge to guide the design and making process. Due to limited time (1–3 hours), energy, and resources, participants in the workshops weren’t expected to create a ‘perfect’ or final garment. Instead, the aim of these low-fidelity prototypes was to provide insights into participants’ sensory priorities and how these could be designed for using trims and materials. Working with a range of participants helped reveal commonalities in sensory interests and how these were fostered through design choices.

As a neurotypical designer conscious of biases in interpreting neurodivergent experiences, participants were considered as equal contributors to the research. These participatory design methods were used with an urgency to include

members of a community who are often excluded from design research (Gaudion, 2014), in a way that aligned with a suitable method of contribution and to ensure participants felt included and empowered (Milton, 2014). Physical prototyping in a group setting was a method that aligned with the backgrounds and experience of participants who were studying or working as artists and designers, as they were accustomed or familiar with these methods of working. Through direct engagement of participants, designs aimed to not be inhibited by the designers’ preconceptions of neurodivergent-friendly clothing such as a focus on removing seams or labels due to common dissatisfaction with these elements (Kyriacou et al., 2021), instead being led directly by members of the neurodivergent community.

GUIDELINES FOR CRAFTING SENSORY EXPERIENCES THROUGH CLOTHING

The majority of participants in this group explored the use of materials and trims to engage the proprioceptive sense, which refers to the body’s ability to sense its position and movement in space. Although there was a commonality in exploring this sense, each individual fostered this feeling in a unique and personal way through a series of design decisions. This highlighted that even for those participants fostering a similar sensory experience, there were a range of ways in which this sensation could be created. As each prototype was distinct and unique, it is preemptive within this research to share specific design guidelines for stimulating the proprioceptive sense. While the findings didn’t determine the ideal way to stimulate the proprioceptive sense that would appeal to the majority of wearers, insights were gained into the considerations designers may make when working *with* prompting the senses.

To develop sensory-driven garments, designers should use materials and trims with an awareness of their sensory impact, engaging participants in reflection on these properties. Throughout the remainder of this paper, one participant’s prototype will be referred to illustrate a range of insights, going forward they will be referred to as K. In the case of K’s prototype, when making the high-fidelity counterpart, an alternative elastic was used as the original one could no longer be sourced. This elastic, although visually similar, was stiffer than the original elastic used. When

testing the high-fidelity prototype, the tactile and proprioceptive properties of the elastic altered the experience of wearing the garment for the wearer. Although 2 months had passed since the workshop, K noticed and remarked negatively on the change in elastic. This moment created some insight into the participants' tacit preferences of the elastic and highlighted the designer's lack of wider sensory clarity of the elastic. Due to the tacit and personal nature of the research, designers are encouraged to prompt participants to gain a thorough understanding of the wider sensory properties of materials and trims. These insights subsequently guide future design decisions made by the designer and impact the effectiveness of the design. In the example of K, the lack of awareness as to the greater sensory-properties of the elastic choice negatively altered the sensory experience of wearing the high-fidelity prototype. Additionally, participants' use of materials and trims often shifted practical design considerations toward a focus on emotional and sensory comfort. For example, K explored creating pressure through the use of buttonhole elastic, subverting the usual functional use of buttonhole elastic. K demonstrates how participants can use trims and materials in an innovative way, rooted in wellbeing and far from the functional use that a traditional fashion designer might use this trim for. Designers are encouraged to allow participants to be an equal contributor to the research to create space for participants to explore the ways in which existing materials and trims can be used in innovative ways.

Many participants' prototypes incorporated adjustability into their low-fidelity prototypes. Very few participants created a garment that created a constant interaction with the body, with the majority of participants creating a design that could be interacted with on their own terms, as and when needed. In the example of K, they used buttonhole elastic to create the feeling of pressure to stimulate the proprioceptive sense. The buttonhole elastic sat flush along the straps and led down to the centre front of the garment, here it was fixed into place with buttons that were sewn onto the bodice. When the buttonhole elastic was pulled tighter and fixed into place with the buttons it created a stronger feeling of pressure for when the wearer was seeking proprioceptive sensory input, such as in a moment of stress or anxiety. Conversely, the elastic could be loosened and held into place with buttons when the wearer was no longer seeking that sensory input.

This adjustability aligns and acknowledges that sensory preferences, such as seeking deep pressure, are not constant but rather they can fluctuate and change. Acknowledgment of these shifting sensory preferences can be supported through adjustable design elements, such as, in this case, the use of buttonhole elastic, or, for example, a design element that can be easily removed by the wearer when not in use.

While fabric choice was not a primary focus for participants, likely due to limited options, it remains a crucial element in providing comfort and ease for wearers (Kyriacou et al., 2021). Research indicates a general preference for softer fabrics, such as satin over spandex (Kyriacou et al., 2021), though nuances within these preferences warrant highlighting. There is a significant difference between actively choosing to touch a fabric and experiencing it continuously against the skin (Kyriacou et al., 2021). The body, as a sensory receptor, has areas with varying levels of sensitivity, making fabric and design placement essential considerations for designers. For example, K, explored design placement at the chest, while others focused on the waist and back. These choices reflect each individual's unique sensitivity in specific areas; although K stimulated proprioception at the chest, another sensation, like a light touch, may not have been as pleasant. Although some general trends exist, such as heightened sensitivity in the upper body (Kyriacou et al., 2021), these individual differences emphasise the importance of combining fabric choice, design, and placement with sensitivity in mind. In practice, this may involve panelling or lining with softer fabrics, especially where abrasive materials might otherwise cause discomfort. Together, these findings illustrate overarching guidelines for designers to consider when promoting a sensory-experience.

THE NEED FOR CRAFTING SENSORY EXPERIENCES THROUGH CLOTHING

From the participants that tested their prototype in context, they reported positively as to the effect the prototype had on their wellbeing. Although the prototypes were not perfect, final garments, participants acknowledged the potential that the garments would have on their wellbeing. K, for example, reported that they first wore the garment in a moment of anxiety and that the garment helped them feel soothed, reflecting that this was probably

due to the proprioceptive feedback provided by the straps. K also mentioned that the top seemed to support their concentration, attributing this to the grounding effect of proprioceptive input, similar to their weighted blanket. Here we see the impact that sensory-drive design has on the wellbeing of wearers and how it can be utilised as a tool for wellbeing rather than simply worn.

Participants reported they felt the garments tested gave purpose to their movements, fidgeting and stimming. Additionally, some participants relayed that they felt encouraged to further explore their own sensory preferences through clothing. Not only did participants contribute to the research directly but they were able to learn more about their preferences and curiosities, suggesting there was some empowering outcome for some participants. The workshops provided an opportunity through which they could learn more about themselves as well as provide insight into the ways fashion can learn from the neurodivergent community directly.

Without K and the other participants' contributions to the design process, it's uncertain how the garment's design or effectiveness might have evolved. Their input was vital, with each participant bringing tacit knowledge and personal experiences to these workshops, shaping outcomes in ways that theoretical research alone might not.

FUTURE RESEARCH

This research included a small sample of neurodivergent individuals, suggesting further collaboration with a wider range of participants is needed. Due to this small sample, it was preemptive to draw conclusions into which materials and trims can be used to foster a particular sensory experience that would appeal to a wide number of wearers. To further research on prompting the senses through fashion, designers are encouraged to continue collaboration with neurodivergent participants. Designers are able to learn a lot about the sensory experience of clothing, and how to design accordingly, through direct and meaningful collaboration. The role of each participant should be aligned with their capacity and preference for engagement. In this research, participants created low-fidelity prototypes; however, this approach would not suit all neurodivergent individuals with suitability being impacted by a number of aspects such as age and ability. By adapting participatory design methods to provide options for partici-

pation, designers can create opportunities for a wider range of individuals to lead and contribute to the process in a way that feels comfortable and meaningful to them.

CONCLUSION

This research aimed to further understand how individual members of the neurodivergent community might foster a sensory experience and to identify commonalities in these design choices. Due to the wide and varied prototypes that emerged this research doesn't share guidelines for designing a sensory experience but rather provide guidelines for working with creating a sensory experience. Designers are able to support sensory-driven design through; adjustability to cater to fluxes in sensory needs, design choices and body placement to acknowledge the range of sensory receptors in the body, developing sensory-insight of materials and trims to shape a sensory experience. These guidelines can assist in the building of a sensory experience that can positively impact wearers.

Inclusive design practices tend to focus on identifying a 'problem' to be 'solved'. Moving away from this approach to avoid interpretation that neurodivergent experience and behaviours are an 'issue', in the context of this research, designs were informed by participants' personal curiosities in terms of clothing and sensory experience. This way of working relied heavily on participants bringing tacit, personal knowledge into a tangible and experiential form. Through this collaboration, insights are gained into how to design with the senses, the effects of this design on wellbeing and a more thorough and empathic understanding of a number of wearers.

The research was limited to collaborating with a small group of neurodivergent individuals, primarily autistic women from, and/or living in, Western Europe aged 18-35. This provides a window into a small subset of individual sensory preferences only. Of course, this demographic does not represent the full spectrum of neurodivergent experiences, highlighting the need for continued work to expand understanding and acknowledge the nuanced diversity within this community. Broadening the scope beyond this participant group would further enrich the approach to sensory-driven design and highlight the range of ways in which participants can contribute to the design of items that impact them.

By shifting the approach of fashion practices from emphasising the visual to the remaining senses, fashion is able to create opportunities for a range of wearers to prosper through wearing, and interacting with, clothing.

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