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WEARABLE MULTI-SENSORY DESIGN FOR ADULTS WITH SPD

TRACEY GUIEB

2022

WEARABLE MULTI-SENSORY DESIGN FOR ADULTS WITH SPD

A thesis presented in partial fulfilment of the
requirements for the degree of

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ABSTRACT

Our senses are extremely important in helping us understand and respond to environmental changes. Someone with Sensory Processing Disorder (SPD) may struggle to create appropriate responses to input through these sensory systems - leading to sensory overload or anxiety. There is limited support for adults living with SPD due to the misconception that only children experience it or that it is a condition that can be 'grown out of as you get older. Most sensory products in the market are targeted at children and are not suitable for individuals who may want to self-regulate discreetly.

My thesis explores how wearable multi-sensory design in apparel can help adults with SPD cope in situations and environments that may cause them discomfort, stress, or anxiety in a way that is appealing and specific to their unique sensory challenges.

Universal design strategies were implemented within an empathic and iterative design process. Secondary contextual research combined with expert consultancy, questionnaires, surveys, and wearer testing, identified specific user needs. Multiple design explorations responding to identified criteria and adult sensory profiles created a range of visually appealing, discreet, customisable sensory wear. This modular apparel range aids adults who experience SPD, as well as a much wider group of individuals who identify with associated sensory challenges.

Keywords: proprioception, tactile, sensory processing, self-regulation, ADHD, Autism Spectrum Disorder, anxiety, sensory quadrants, deep touch pressure

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND AND CONTEXT

It's June 2020 and I'm walking up Tory Street to my first class of the term - I'm about to start the final project of my Bachelor of Design degree. At this point, I have no idea what my topic will be, which only increases my anxiety. My mind is racing with random ideas and nervous thoughts. Amongst those thoughts, I keep telling myself, "This is my last project... it has to be something I'm passionate about." nothing sparks. I feel the anxiety and nerves take over as I get closer and closer to uni. With my arms crossed, I feel my palms sweat and can't keep my hands still. Naturally, I reach into my pockets and aggressively start fiddling with my Chapstick. All I notice are people's eyes on me, and I think, "Am I the only one that does this? I must look crazy!" But a thought comes to mind that breaks the racing thoughts "what if there was a way that I could fidget and not have it be obvious to people around me?"

Growing up, I was always interested in fashion. It was a way that I could express myself and draw self-confidence from. This started when I first learned how to sew. I saw

potential in clothes that didn't fit me, but I knew I could alter them to suit. How then could I use my passion to create a garment that could serve as an aid for those, like myself, with similar experiences?

The year prior, I had taken an Accessible Inclusive Fashion Design paper. Our group designed garments for blind and low-vision individuals to aid them in getting dressed. This course deeply influenced and sparked my interest - it challenged and matured my understanding of fashion. I realised that fashion had more purpose than beauty alone and could solve real-world issues by allowing the design process to be intimately focused and sensitive to the end user's needs. I knew I wanted to continue this in my practice.

My Bachelor of Design project, BenifiSense (2020), was a jacket that aimed to help adults with SPD cope in environments where they may be prone to experience sensory overload. I wanted to design for this demographic as I became aware of the lack of

appropriate products available on the market. However, due to the short 12-week timeframe of this project, I was unable to perform user testing during my Bachelors. I wanted to explore how I could modularise a garment to make it more customisable and personal to the user so that it could better fit each individual's unique sensory preferences.

"[I use a] Weight [sic] blanket to sleep, but I want to explore other things in the day to calm down" [Response from 40+, Female, respondent to Questionnaire, 1 Oct. 2021].

"Every time there is a pressured situation, it normally requires wearing clothes I am not comfortable in." [Response from 40+, Non-binary, respondent to Questionnaire, 1 Oct. 2021]

1.2 PROBLEM STATEMENT

There is limited support for adults that experience sensory processing issues as many professionals lack the awareness of SPD and its symptoms and its secondary symptoms as a result of coping with SPD, such as “anxiety, aggression, poor self-esteem, relational concerns” (Goodman-Scott et al. 235). This leaves many without an explanation for the way they act or feel.

While products exist for people with sensory processing issues, they are aimed at children or appear clinical, utilitarian and highly specialised.

Classically, fashion’s primary design focus was to appeal to the visual sense. Garments must be designed for beauty and aesthetics– unfortunately, designing for the other senses becomes an afterthought. This is a problem, as we are all sensory beings, and the other sensory systems are all just as important as each other.

1.3 RESEARCH QUESTIONS

What products are currently on the market, what are they addressing, and where are there gaps?

How can sensory design help adults wanting more independence and ways of coping in contexts where being discreet is necessary?

What other conditions are related to SPD, and how can universal design principles be used to create a holistic product that can benefit each context?

1.4 RESEARCH AIM

To determine what aspects of garments people with SPD value; to aid in the design and creation of a set of multi-sensory garments that give adults with sensory processing challenges the ability to self-regulate discreetly and remain in environments that may otherwise cause them discomfort and stress – i.e. Adults with SPD whose primary coping mechanism is avoidance. Environments aren’t always easy to alter, so I want to offer something that can instead prepare and equip the individual to cope with stressful situations.

My thesis explores how multi-sensory design in apparel can:

- Help adults with sensory processing challenges in a way appropriate and specific to their individual sensory needs by enabling them to self-regulate and achieve sensory equilibrium through sensory modulation.
- Offer an alternative to the many separate sensory products currently being utilised.

1.5 METHOD OVERVIEW

Throughout the project, I utilised a user-centred approach, primarily through empathic design using the Functional-Expressive-Aesthetic (FEA) framework and an iterative design process. I carried out a mixed methods approach for data collection and analysis. Lamb and Kallal's FEA framework informed empathic garment design principles, which helped me better understand the needs of the primary user group (adults with SPD). Designing from an empathic standpoint gave me the ability to appreciate the challenges and idiosyncrasies of those with SPD and those with other similar or related conditions.

Universal design thinking helped me relate and draw similarities between neurodivergent users and those with SPD to develop an understanding of the co-related conditions, the common challenges experienced, the similar behaviours of these people and their responses to stimuli. This helped develop a creative way that facilitates improved wellbeing within a solution for both neurodivergent and neurotypical people – realising a wider benefit a multisensory garment could provide through universal design.

I focussed on the following Universal Design principles:

- Equitable use
- Flexibility in use
- Simple and intuitive use
- Low physical effort

(Preiser and Smith; Park et al.).

Tim Brown's Design Thinking model guided the iterative process throughout the project. This process included 'empathise', 'define', 'ideate', 'prototype', 'test' and 'implement' stages which helped ensure that user needs were constantly reviewed and addressed at key stages of the process.

I used a mixed methods approach to gather data through anonymous open-ended questionnaires. This provided me with quantitative and qualitative feedback and responses, which helped me understand each user's individual and unique sensory profiles.

All these elements worked together to inform my overall design criteria.

CHAPTER 2: CONTEXT REVIEW

2.1 SENSORY SYSTEMS AND THEIR ROLE IN HELPING US RESPOND TO EXTERNAL STIMULI

To apply user-centric design effectively, it is essential to understand the significant role our senses play and their influence on our emotions and behaviours. Our senses are extremely important in helping us respond to environmental changes. As well as our five sensory systems of touch, taste, smell, sound and sight, three other 'internal' senses are often overlooked –the interoceptive sense, proprioceptive sense and vestibular sense (Ponzo 19).

Through my designs, I focus on the proprioceptive and interoceptive senses as a vehicle for self-regulation and sensory modulation, as they are the most practical senses to address through a garment.

The interoceptive sense is often thought of as the "hidden sense" (Weng et al.). It tells us what is happening inside our bodies – hunger, thirst, and the recognition of tiredness are all examples of interoception and is responsible for how an individual

perceives their own body (Schmitt and Schoen). Research has shown a clear link between interoception and emotions, as they both relate to overall self-awareness, self-regulation, and sense of self (Koscinski; Mahler). As Schmitt and Schoen point out, "interoception is not a unitary sensory domain. It is a multidimensional, complex system representing the integration of multiple senses" (2). For people with difficulties with self-regulation, it is likely they also have underlying issues with interoception – which may lead to challenges in emotional regulation. This is common across conditions outside of SPD, including autism, anxiety, depression, and trauma (Mahler), highlighting other potential conditions that could benefit from a garment-based tool to help with emotional regulation.

The proprioceptive sense is generated in our muscles and joints. It is the sense which tells us where our body is in space, without relying on external stimuli or another sense to guide us – such as touch or sight (Heffernan 33). Proprioception detects and controls our subconscious perception of force and pressure. For example: knowing how much force to apply when holding a crayon without breaking it or informing the brain to relax muscles when receiving a massage.

Our vestibular system located in our inner ear canals is responsible for providing the brain with information about the motion and positioning of the head in relation to gravity. This allows us to keep our balance while moving and assists in maintaining posture when sitting or standing (Kranowitz).

Even though the senses are an intimate part of the human experience, we are still discovering more about our senses and their link to our overall wellbeing. Furthermore, designing for the internal senses poses a unique challenge for designers as it depends on user perception making it highly subjective by nature. This highlights the importance of user feedback and the value of user testing and empathic design.

2.2 SENSORY PROCESSING DISORDER

A deeper understanding of any condition helps designers appreciate its nuances to better design for affected users. Sensory processing refers to how our nervous system receives, interprets, and responds to sensory input. For someone with a Sensory Processing Disorder (SPD), their brain may struggle to make sense of and create appropriate responses to one or multiple inputs from the sensory systems (Allarakha; Miller, Nielsen, et al.).

The condition was first recognised by occupational therapist Jane Ayres (1996), who referred to it as Sensory Integration Dysfunction (SID). SID affects daily functions and causes atypical behavioural, emotional, or psychological responses to sensory input. Atypical responses are defined as either over-responsivity (heightened responses) or under-responsivity (diminished responses) to sensory stimuli at otherwise normal levels (McMahon et al.; Bijlenga and Kooij). This is now recognised as SPD (Miller, Nielsen, et al.) as sensory processing refers to the condition itself, whereas sensory integration refers to the therapy.

While SPD affects up to 17% of the global population (Goodman-Scott et al. 234; Miller, Schoen, et al.), SPD is still often seen as an 'invisible' disorder; many people go undiagnosed for most of their life or never receive a diagnosis.

There are three subtypes of SPD: Sensory Modulation Disorder, Sensory-Based Motor Disorder and Sensory Discrimination Disorder (Miller, Anzalone, et al.).

2.21 Sensory Modulation Disorder (SMD)

A person with Sensory Modulation Disorder (SMD) will have issues responding to sensory stimuli across single or multiple sensory systems. This means that they may either be sensory over-responsive (SOR), sensory under-responsive (SUR), or sensory craving (SC) – where the individual needs input from different sensory stimuli (Bar-Shalita, Vatine, et al.).

Individuals who are SOR have a "predisposition to respond too much, too soon, or for too long to sensory stimuli" (Subtypes of SPD) and may find non-painful stimuli as abnormally irritating (Bar-Shalita, Granovsky,

et al. 1). For example, some of the users I worked with, disliked the feeling of velvet. When you run your hands across the fabric in one direction, it feels smooth, but in the opposite way, it can feel rough and unpleasant to touch.

SUR individuals have a "predisposition to be unaware of sensory stimuli, to have a delay before responding, responses are muted or respond with less intensity than the average person" (Subtypes of SPD). For example, they may fail to notice someone calling their name until they are shouted at.

If they are SC, they are "driven to obtain sensory stimulation, but getting the stimulation results in disorganisation and does not satisfy the drive for more" (Subtypes of SPD). For example, some users I worked with benefit from keeping their hands occupied to focus on an unstimulating task.

2.22 Sensory-Based Motor Disorder (SBMD)

SBMD affects a person's balance, motor coordination and ability to perform skilled habitual and non-habitual

motor tasks. An example of this is an individual not being aware of the positioning of their hands and fingers, struggling to tie their shoelaces (Niutanen et al.).

A related condition, Dyspraxia, also falls under this subtype of SPD. Individuals with Dyspraxia have trouble processing sensory information correctly. They experience “Difficulty in thinking, planning, and executing skilled movements, especially novel movement patterns” (Allarakha). “These individuals are clumsy, awkward, and accident-prone” (Subtypes of SPD) and may have trouble with fine motor activities.

2.23 Sensory Discrimination Disorder (SDD)

Sensory discrimination is the ability to accurately interpret inputs from the senses (Subtypes of SPD). Those with SDD may struggle to recognise the characteristics of sensory input, making it challenging to decipher and give meaning to the differences and qualities of the stimuli – they find it difficult to generate appropriate responses to stimuli (Allarakha). For example, they may be unable to distinguish a two-dollar coin from a one-dollar coin in their pocket.

2.3 ADULT SENSORY PROFILES

SPD presents itself uniquely in each individual. For each sense, everyone has their own threshold and response tendency when reacting to stimuli (Metz et al.). These can be visually represented through personalised sensory profiles. Sensory profiles can be used by health care practitioners and designers alike better to understand the sensory response of users with SPD – knowing how users respond to stimuli can help designers formulate design criteria that reflect and caters to individuals’ uniqueness.

The Adolescent/Adult Sensory Profile (AASP) is a tool that was developed in 2002 by Occupational Therapists Winnie Dunn and Catana Brown, which illustrates how an adult typically responds to sensations indicative of persistent sensory processing preferences (Brown & Dunn, 2002). An individual completes a self-questionnaire to create a sensory profile, which is then analysed by comparing the individual’s behavioural response and neurological threshold when receiving input in each of the different senses through Winnie Dunn’s Four Quadrant Model of Sensory Processing (Goodman-Scott et al.). The four quadrants include “low

registration, sensation seeking, sensory sensitivity, and sensation avoiding” (C. Brown et al.; Bijlenga and Kooij; Rieke and Anderson).

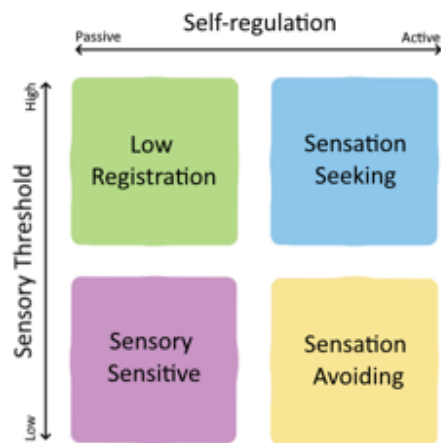


Fig. 1. Adapted from ConnectABILITY, *Four Quadrant Model of Sensory Processing*, July 2022, <https://connectability.ca/2020/07/14/four-patterns-of-sensory-processing/>.

This model is based on two constructs: neurological threshold and behavioural response. The first construct, ‘neurological threshold,’ refers to the threshold for response to a sensory stimulus (Rieke and Anderson).

- Individuals with low neurological thresholds (hypersensitive) tend to be more responsive to stimuli because their systems are activated by their senses more easily.
- Individuals with high neurological thresholds (hypo-sensitive) tend to be less responsive to stimuli and may miss cues that others typically respond to (C. Brown et al.).

The ‘behavioural response’ determines whether an individual responds passively or actively to stimuli.

- Individuals with passive tendencies are less likely to proactively alter their environment, even though they may still have an internal response to the stimuli.
- Individuals with active tendencies are more likely to alter the type and intensity of sensory stimuli in their environment (Dunn, “The Impact of Sensory Processing Abilities on the Daily Lives of Young Children and Their Families”; Metz et al.).

Occupational Therapists use the tool to help formulate interventions and strategies to help manage SPD.

The tool helps to:

- Visualise how an individual’s sensory processing ability may impact functional performance in everyday life.
- Understand an individual’s tendency to respond to stimuli and which sensory systems may be impacting or influencing functional performance.
- Provide standardised quadrant scoring (defined as ‘much less than most people to’ to ‘much more than most people’) and identify the sensory profile an individual tends towards.
- Understand the behavioural tendencies of individuals with conditions other than SPD, such as Asperger syndrome, autism, and ADHD (Clark).

The Adult/Adolescent Sensory Profiles tool helped me as a designer to understand and quantify the needs and preferences of my user testers (unpacked in the Methods section ahead).

2.4 OVERLAPPING AND RELATED CONDITIONS

While SPD continues to gain recognition across multiple medical and health disciplines, it is still not considered to be a stand-alone condition – but instead remains classified as a symptom of Autism Spectrum Disorder (ASD), however, increased evidence shows that SPD can indeed exist on its own as a stand-alone condition (Miller, Nielsen, et al.), and can be assessed separately from ASD (Goodman-Scott et al. 237). The lack of support and diagnosis experienced by adults is also reflected in the challenges experienced by those with autism.

In the short film, *Autism: One Man's Journey*, Scott Klumb was not diagnosed until he was 23. Scott's mother highlights the frustration of the lack of support for adults, saying, "Even when we got the diagnosis of autism because he was in his twenties, there was nowhere to send us... there were no services; there was nowhere for us to go as a newly diagnosed adult" (*Autism: One Man's Journey*).

The same lack of and late diagnosis of conditions in adulthood is also observed in anxiety and depression

- adults are left on their own wondering if they are "normal". It is also proven that "childhood SPD predicts Anxiety Disorder in adults defined by difficulties with emotion regulation, mediated by adult SPD symptoms" (Miller, Marco, et al. 3). This is further evidence that SPD is a condition which continues from childhood, through to adulthood. Additionally, a recent study by McMahon et al. (2019) explored the existence of SPD in adolescence and its relation to generalised anxiety disorder (GAD). The study found that SPD symptoms in adulthood accounted for the relationship between childhood SPD symptoms and lifetime anxiety disorders – and concluded that "high symptoms of SPD in childhood lead to high SPD symptoms in adulthood" (McMahon et al.).

Other conditions linked to SPD include Obsessive Compulsive Disorder (OCD), Body Focussed Repetitive Behaviours (BFRB), Depression, and Post Traumatic Stress Disorder (PTSD), with ASD and OCD both caused by hypersensitivities to sensory modalities (Teng et al.; McMahon et al.; Kinnealey and Fuiiek; Rieke and Anderson)

Compared to other related conditions, SPD remains poorly understood. Despite clear links and compelling evidence surrounding the interrelationship between SPD and other well-established conditions, the vast majority of SPD literature to date is focused on children, and research into adults lacks empirical evidence to prove its relevance in practice beyond theory. Not only is the amount of research into SPD in adults scarce, but the unfamiliarity with the lesser-known senses is evident, as seen in the lack of conclusive research in this area.

With a deeper understanding and appreciation for SPD, its related conditions, and studies; along with the evidence and research which highlights that our senses, emotions, and sense of being are all related – how can I, in an exploration into multi-sensory design, create a garment that can serve as a tool to aid those with sensory processing challenges, in a way that is personalise-able and beneficial, through the modulation of the senses?

2.5 SENSORY MODULATION

There is increasing interest in Sensory Modulation in the healthcare field, especially as SPD is gaining recognition as its own condition rather than just a symptom (A. Brown et al.). There are three main definitions of 'Sensory Modulation:

- Sensory Modulation as a **behavioural response:** Brown et al. introduce the concept of Sensory Modulation as a behavioural response to an external stimulus, defining it as "the ability to appropriately regulate and organise sensory responses" (516). For example, rubbing an injured body part to apply deep touch pressure to soothe.
- Sensory Modulation as a **therapy** (Azuela and Robertson; Brown and Fisher): Brown and Fisher discuss this as a therapy "used in mental health by occupational therapists to assist clients to self-soothe, establish emotional stability, de-escalate aggression and enhance occupational performance" (2).
- And Sensory Modulation as a **neurophysiological response:** This concept Brown defines as "the neurophysiological reaction which alters cellular mechanisms for habituation and sensitisation" (A. Brown et al.; Miller, Anzalone, et al.)

My thesis focuses on Sensory Modulation as a behavioural response, as this presents an avenue for design opportunities.

2.51 Tactile Proprioception: Sensory Modulation Through Joint Compressions and Self Hugging

Joint Compressions are an effective technique for calming and creating a grounded feeling - commonly practised in occupational therapy. An occupational therapist applies joint compressions on an individual by applying deep touch pressure on both ends of the joints through their hands - this is typically done on the shoulder, elbow, and wrist areas. Joint compression works by activating the different specialised nerves that work harmoniously to inform the proprioceptive sense.

These nerves are activated when compression, push, or weight bearing is placed over a joint. Proprioceptive nerve endings send impulses which travel slowly to the brain when we apply compression over the joints and muscles. Deep touch pressure promotes self-regulation and can be very calming, regulating, and organising for the brain and nervous system ("What Are Joint Compressions?"). However, this is something that cannot be applied to oneself.

The most common and discreet way of applying deep touch pressure is self-hugging. Crossing arms in a self-hugging motion is a common behavioural reaction that is not only an instinctive response to stress, discomfort, and anxiety but it also is shown to have a pain-relieving effect (Gallace et al.). Not only is it easy for an individual to apply to themselves, multiple studies have shown that the act of self-hugging releases the hormone oxytocin, reduces cortisol, generating calm and reduces feelings of fear and anxiety (Neff; Goodin et al.).



Fig. 2. Stills from Supporting Families Auckland, *Sensory Modulation* (3:08-4:30)

We can combine this knowledge with the phenomena known as 'Multi-sensory Integration' - this refers to the process in the brain that occurs when sensory input from two or more different senses come together (Miller, Nielsen, et al.). This presents itself as an opportunity to use multi-sensory design within the context of garment design. For instance, tactile and proprioceptive input has been shown to share the same sensory pathway. We can leverage the stimulation of the proprioceptive sense to stimulate the tactile sense (for example, through deep touch pressure applications, via compression material or placement of weights) within a garment to bring about positive change in those that may be exceptionally sensitive to touch, or tactile defensive (Dougherty). Other studies have shown further benefits of multi-sensory design:

- Objects are more memorable when experienced through multiple senses. This can help older user groups where sensory perception is diminished - reducing product abandonment and promoting product familiarity with objects within the elderly (Engel-Yeger and Rosenblum 1).

It can help users more easily identify and recognise other features of the object by providing supporting sensory cues, for instance, zipper or pocket linings in a contrasting colour or buttons, zippers, and closures in a different texture (Lupton and Lipps 2891).

2.6 WHAT SUPPORT EXISTS?

Depending on the type of SPD an individual has, the kind of therapy may vary. Some therapies include Sensory Integration Therapy, Occupational Therapy, Physical Therapy, Cognitive, Behavioural Therapy, and Play Therapy. However, most of these are only available for children, leaving adults living with SPD with little support in the form of therapy and services. Furthermore, existing products are not suitable for environments where individuals may want to self-regulate discreetly. For example, fidget spinners and ear defenders.

There is a misconception that only children experience SPD, or as they get older, they simply grow out of it, but in fact, adults formulate their own ways of coping (Goodman-Scott et al.). As C Brown emphasises, this "is unfortunate, given evidence that sensory processing concerns in children also are experienced by adults" (75). Adults need to learn how to manage their condition in a relational and individualised approach, much like the strategies used in occupational therapy - "it is like a puzzle to solve and sometimes you have to try multiple pieces before finding the one that fits" (Strugnell,

Sensory Clothing for SPD). Existing strategies such as sensory diets and sensory-based interventions can help individuals become more sensory smart so that they can consciously act and do what helps them to self-regulate and regain emotional control – however, becoming sensory aware can prove challenging, even for adults, and requires a certain degree of insight and self-awareness to achieve (Biel and Peske 146).

It is truly unfortunate that adults have limited avenues of support and tools available to aid them with sensory processing challenges – something I can empathise with and relate to. However, there are existing tools available (albeit requiring a certain level of clinical understanding to be helpful in a design context) that can help designers keep the unique and individual challenges of those with SPD at the top of mind. How then might I create a garment-based tool that helps users be more sensory smart and aware while keeping the design flexible to facilitate individuals' unique coping strategies?

CHAPTER 3: DESIGN PRECEDENTS

3.1 EXISTING SENSORY PRODUCTS

To date, the current market offerings for sensory products and clothing for adults are limited due to a lack of research. The products available are better suited to children, and there is a gap for products suitable for adults to use (Stokes and Black). What does exist isn't fashionable, looks clinical or is not discreet enough to be used in environments where they don't want to draw attention to themselves.

3.11 Fidget Products

There is a preconceived idea that people who couldn't sit still in a classroom were either distracted, unengaged or naughty. However, from my research on fidgeting in relation to ADHD, ASD, and SPD, I found there was much more to this behaviour. It has been proven that fidgeting effectively calms and creates focus for an individual. Recent studies from The University of Auckland discovered a connection between fidgeting and the cognitive executive decision-making part of the brain using MRI scans. The studies found that while fidgeting, there is increased blood flow to the brain in both people with ADHD and those without (White). This shows that fidgeting provokes a similar response in people, regardless of diagnosis, identifying fidgeting as a potential avenue for universal design.

The following positioning map (Fig. 3.) looks at where some existing products for providing tactile input. Some fidget items included here are spinner rings, fidget cubes, fidget spinners, Koosh balls, Stress Balls, and Pop-its. They facilitate calm and focus through repetitive movements, providing tactile and, in some cases, auditory input.

The table on the following page (Fig. 4.) analyses three fidget products that stood out to me as being the most effective and suitable for my intended user group as they were the most discreet, not just in size and quietness but also in the user's interaction with them.

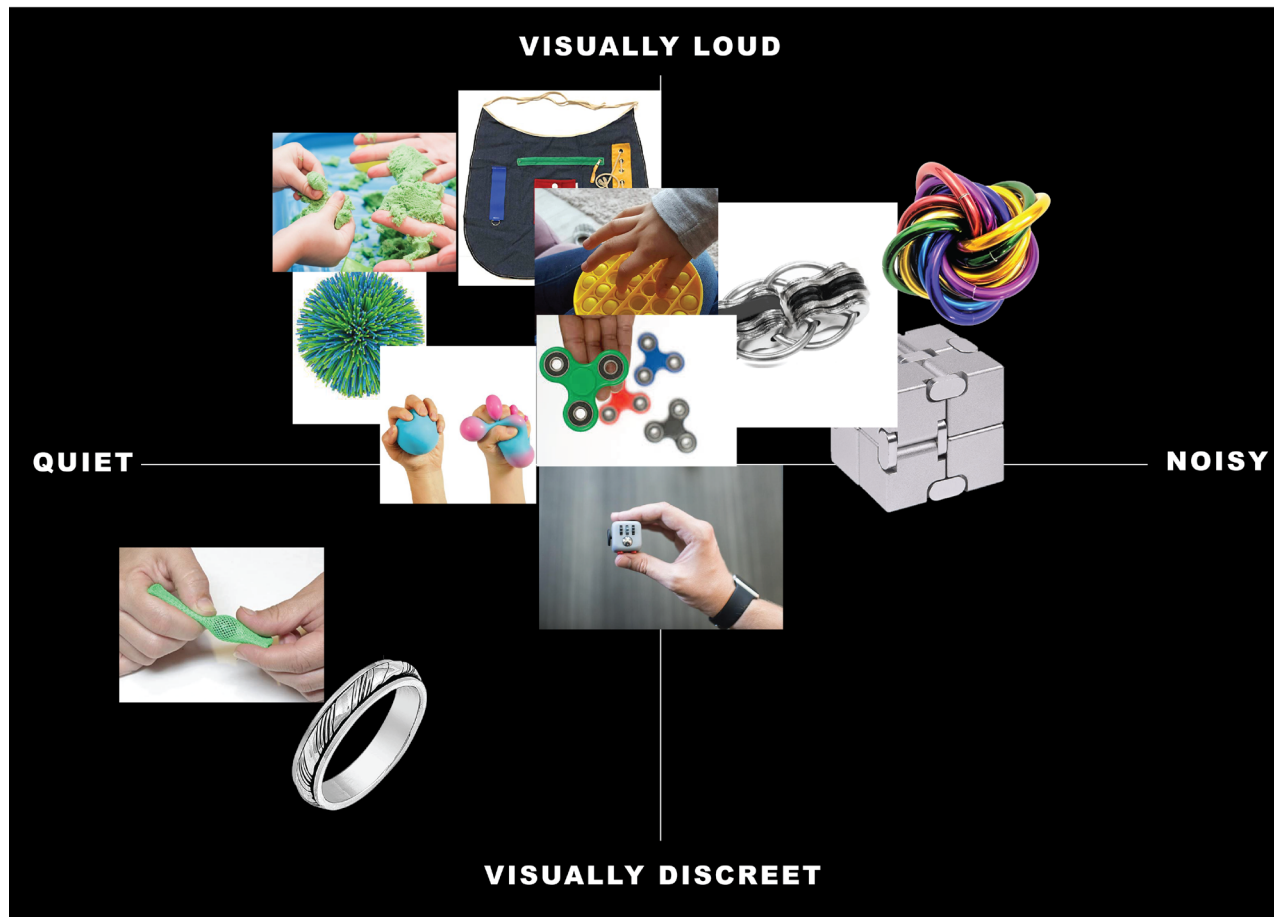


Fig. 3. Fidget Products Positioning Map, author's work




Fidget Product	Images	Description	Purpose	Effectiveness	Further Opportunity
Spinner Rings		A ring within a ring, that the user can spin while wearing.	To give the user a discreet and wearable option to fidget with, to help calm or focus them.	Good for discreet fidgeting and doubles as jewellery. Materials currently used aren't the quietest, and the sound of certain materials rubbing together may be unpleasant to some.	<i>Opportunity to use quieter materials?</i>
Boink		A pocket-sized mesh tube with a marble that can be pressed through it.	To allow the user to keep their hands busy in a small and quiet product.	This is quite effective in its discretion and is one of the quietest fidgets, however the size of it makes it a lot easier to misplace.	<i>Opportunity to add features that make this less likely to lose?</i>
Fidget Cube		A small handheld cube that features a different type of interactive components on each face.	To be easily kept in a pocket and provide variety of different fidget movements in one product.	It fits nicely in pockets, but some faces can be noisy. It's size and shape mean the user can't avoid the faces they dislike.	<i>Opportunity for modularisation of different components?</i>

Fig. 4. Fidget Products Table, author's work

3.12 Tactile – Proprioceptive Products

After looking at the currently available products on the market that aim to activate the tactile-proprioceptive sense, I found deep touch pressure to be the most practical and sensible application of tactile-proprioceptive stimulus that could be implemented in a garment. I identified three broad categories of deep touch pressure applications in garments: weighted, compression and inflatable.

After speaking to an occupational therapist (Strugnell) about her preferences for wearable tactile proprioceptive products, I found that compression was the more effective application of deep touch pressure, as the pressure applied is more consistent and less likely to shift across the body. While compression clothing is a more effective solution, the current options available are not the most appealing or discreet for adults, and some garments are quite limited in their application and flexibility of use.

Weighted vests work the same way as compression garments by providing deep touch pressure to the torso - which acts as a hug and is effective at calming and creating a sense of body awareness through joint and muscular compression. However, weighted products have more specific guidelines that must be followed when using them. For example, for safety reasons, weighted vests should only be worn for 15 minutes at a time and should only be 5-10% of the body weight (VandenBerg 623). Regular use of weighted vests is discouraged, as its effectiveness decreases over time due to habituation, the body 'getting used to' the product. Its clinical effectiveness is also debated (Watkins and Sparling).

Much like weighted applications, inflatable vests' effectiveness is also questioned. Watkins and Sparling performed a study on an inflatable vest, the Snug Vest, in which they found that the product failed to reduce stereotypy in children with ASD (Watkins and Sparling). Strugnell mentioned that people tend not to use these types of devices as they are quite bulky, generate a sense of stigma, and are not very empowering for the user, which caused me to look into the general views surrounding DTP vests. I found many negative reviews, mentioning products such as the Squease Wear and PresSure Vest being prone to smelling like chemicals, not considerate of the needs of the sensory-sensitive audience.

For individuals that crave tactile and proprioceptive input in their mouth (oral seekers), chewellery is a more discreet alternative to nail-biting, chewing on pens or gum, biting on cuffs, aglets, or shirt collars. However, my questionnaire revealed that many adults with SPD are opposed to wearing accessories. These products are highlighted in the following positioning map (Fig. 5.). They facilitate calm and focus through engaging deep touch pressure receptors in the body.

In the table on the following page (Fig. 6.), I placed the current market offerings of tactile-proprioceptive products into three application categories: weighted, compression and inflatable. The table analyses the effectiveness of products and highlights areas of opportunity.

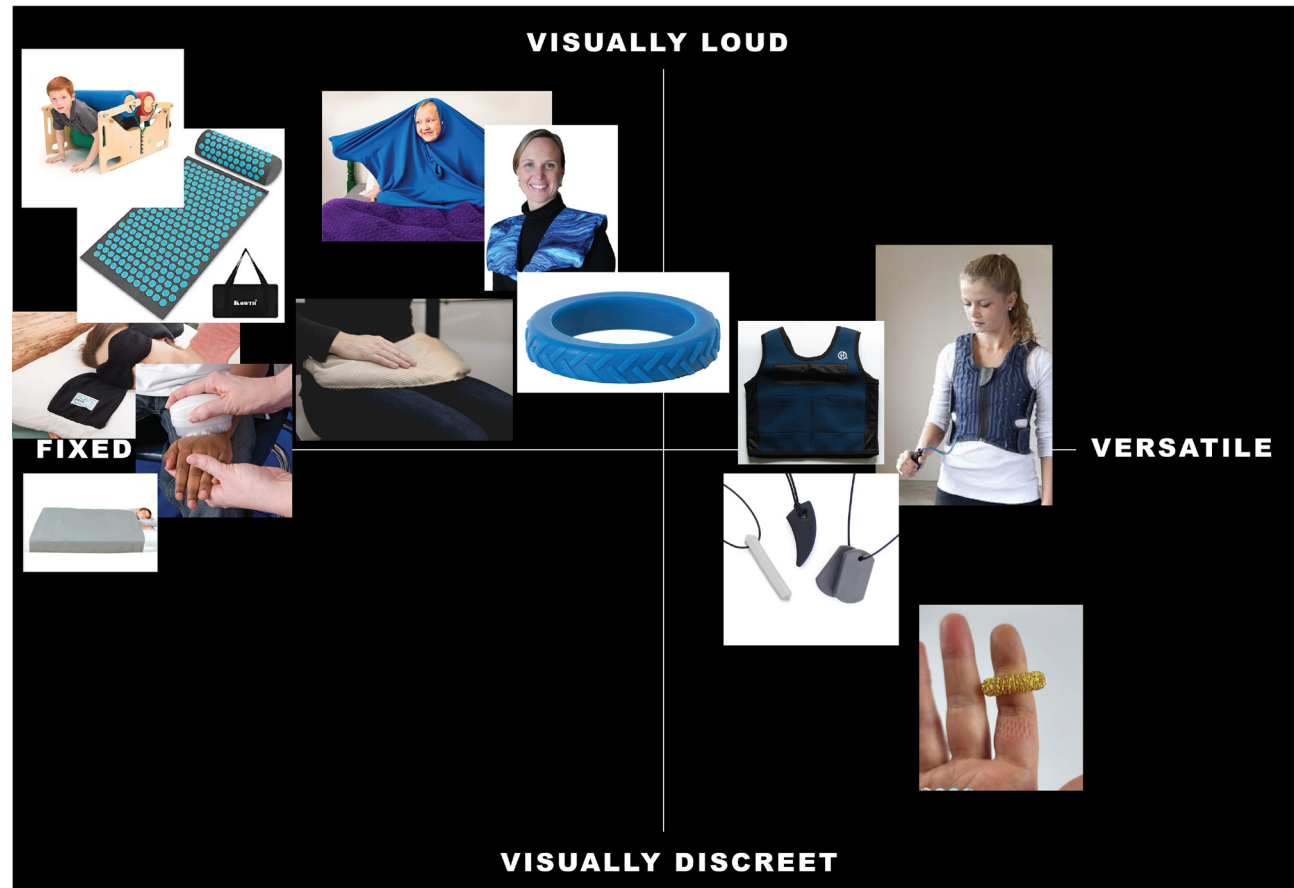


Fig. 5. Tactile-Proprioceptive Products Positioning Map, author's work

Deep Touch Pressure (DTP)	Types	Description	Purpose	Effectiveness	Further Opportunity
Weighted Products	<ul style="list-style-type: none"> • Vest • Blanket • Lap Pad • Scarf 	<p>Weighted vests should only be worn for 20mins at a time.</p> <p>Should not exceed 10% of body weight.</p>	To keep pressure on shoulders, neck and chest area for a calming and grounding feeling.	Weighted blankets are the most effective across a wider range of people and are shown to aid in sleep. Wearable weighted products look specialised and bulky, and distribution of weight can be inconsistent.	<i>Opportunity to design a weighted garment that looks more visually appealing and stops weight for shifting across the body.</i>
Compression Products	<ul style="list-style-type: none"> • Hammock • Sheets • Vest • Shirt • Leggings • Bands 	Wearables are generally worn under clothing, apart from some compression vests.	To have an even amount of pressure across the body to create a calming feeling.	Can keep the pressure more evenly spread across the body and the resistance provided by the compression fabric can be quite comforting. However, what exists appears either too specialised or can only be worn under clothes. Can be quite restrictive and lack the ease of adjustability, donning, and doffing.	<i>Opportunity to design desirable compression garment, that is easily adjustable while wearing and allows the user to apply compression where and when needed, according to their own preferences.</i>
Inflatable Products	<ul style="list-style-type: none"> • Vest • Jacket 	Vest or jacket with air pockets that can be inflated by a bulb to apply pressure across the torso.	The user can choose when to have the garment inflated and how adjust the amount of pressure.	It provides more flexibility for the user as they can adjust the pressure with a bulb and deflate when not needed or needing to adjust. However, current offerings aren't discreet as they can be quite bulky, loud and look specialised.	<i>Opportunity to design a garment that achieves the adjustability of inflatable products without drawing attention to the user.</i>

Fig. 6. Tactile-Proprioceptive Products Table, author's work

3.13 Interoception – Deep Breathing Products

Respiration (how you breathe) dictates every internal process in your brain and body; with respiration being the only autonomic function you have direct control over, deep and slow breathing and mindfulness are essential for emotional self-regulation (Nobis et al.). “The autonomic nervous system (ANS) and respiratory activity have been shown to be closely associated with the experience of emotions. There are certainly characteristics of sympathetic/parasympathetic activity and respiration that are correlated with certain emotional states such as anxiety or happiness” (Kop et al.). Two systems exist in balance and govern the human autonomic response – the sympathetic (fight or flight) and the parasympathetic (rest and digest) systems. When we experience stress, pain and discomfort, our sympathetic systems activate, our respiration rate increases, and breaths become shallower. By mindfully altering our respiration (through breathing exercises or practices such as meditation), we can override the balance of the autonomic system and shift to the activation of the parasympathetic system, to ‘rest and digest’ and generate calm (Jerath et al.).

A few products have addressed this and are highlighted in the following positioning map (Fig. 7.). I analysed some of the more successful interoceptive products on the market in the table on the following page (Fig. 8.). Among these include the Spire Stone. This is a respiration monitor that you clip into your waistband or bra, and it works by detecting stress through abnormal breathing patterns and warns the user through vibrations. The device is linked to an app on your phone with breathing exercises, calming music, and podcasts to help encourage healthy breathing. It uses incentives such as congratulating the user when practising meditation. However, the device may be uncomfortable to wear - as it's intended to be clipped onto a waist belt or bra and can be felt and seen through clothing. Other products that deal with this more inconspicuously are the Oura Ring and Fitbit, which act as tools and accessories.

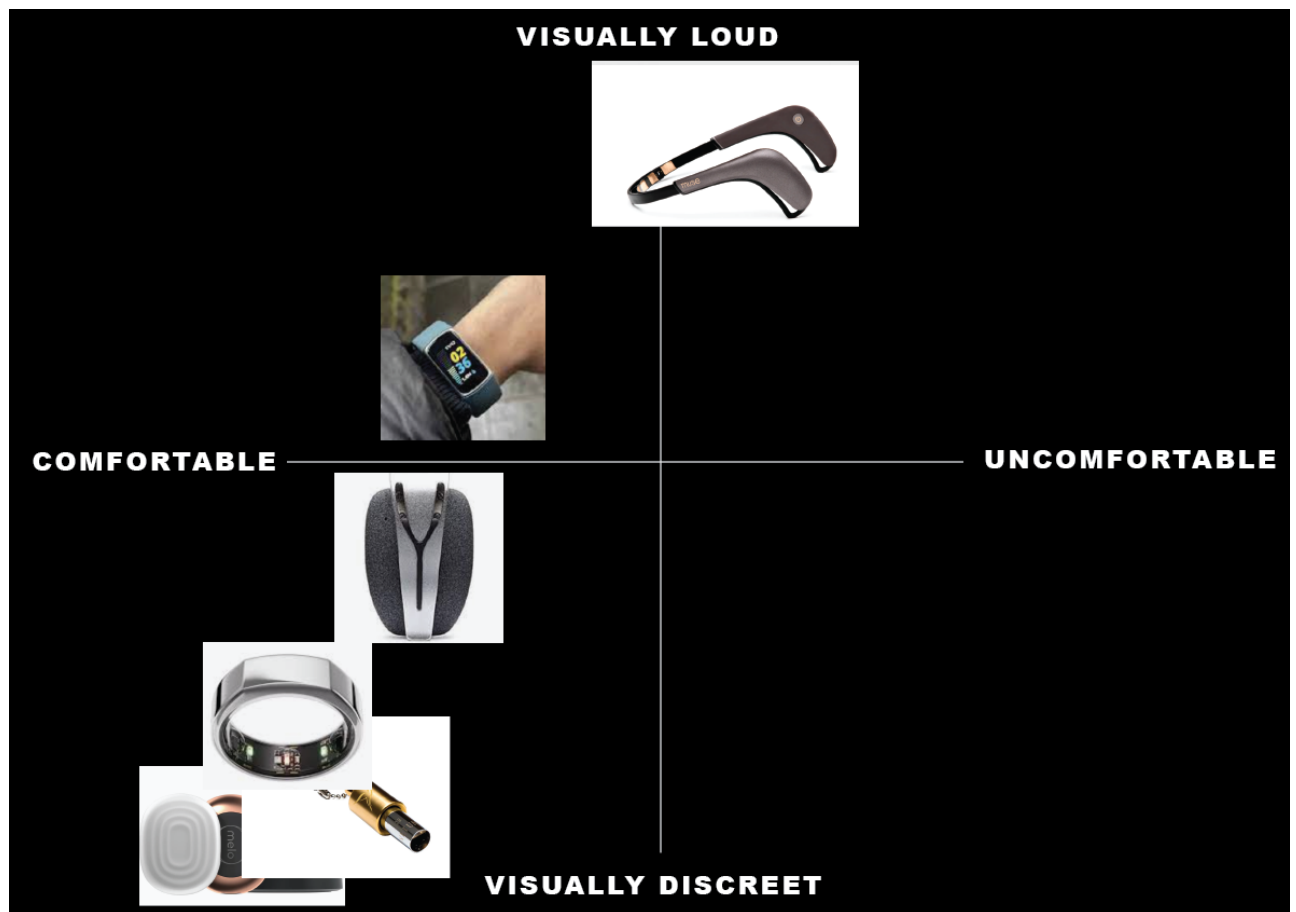


Fig. 7. Interoceptive Products Positioning Map, author's work




Deep Breathing Products	Images	Description	Purpose	Effectiveness	Further Opportunity
Spire Stone		A clip-on wearable designed to analyse breath rates. Measures the movement of the torso or abdomen via its patented respiration sensors.	Monitor stress and activities and identifies levels of tension, calm, or focus based on breath rate.	Comfortable and light weight design for neurotypical users, however the placement could be an issue for users that are more tactile defensive. Vibration function to serve as a reminder to breathe. Reviews found the application of this product to be inconsistent, one review saying that the product sometimes sensed active breathing while the product as not being worn at all. Users need to commit to using the companion app to gain full benefit of breathing exercises tutorials.	<i>Even while being worn on around the chest area, readings are inaccurate. Opportunity to refine the product itself and/or the companion application to better interpret the data being recorded by the device.</i>
Oura Ring		A jewellery inspired wearable designed to analyse body biometrics.	Measures respiratory rate, heart rate, and heart rate variability, body temperature, movement, oxygen saturation. Uses the biometric measurements to calculate sleep quality, activity tracking and Readiness score.	Probably the most inconspicuous health tracker on the market. Discreet, minimalizing and aesthetically pleasing. Uses research grade sensors to provide highly accurate readings and measurements. Companion app is well designed and intuitive, however is required to be used alongside the ring to view insights and follow guided breathing exercises.	<i>Opportunity to include some form of haptic feedback that allows the ring to serve as a reminder to breathe without the use of the app.</i>
Fit Bit		A bracelet inspired wearable designed to analyse body biometrics.	Measures respiratory rate, heart rate, and heart rate variability, body temperature, movement, oxygen saturation. Uses the biometric measurements to calculate sleep quality, activity tracking and Readiness score.	Sensors to provide accurate readings and measurements. Screen allows users to read and track their body measurements without the use of the companion app. Haptic feedback allows the product to alert the user to body events. Companion app is well designed and intuitive, however needed to take advantage of the included, guided breathing exercises.	Opportunity to provide the same technology in a smaller design, size may not be suitable for smaller wrists.

Fig. 8. Interoceptive Products Table, author's work

3.14 BenifiSense

My final Bachelor of Design project was a multi-sensory jacket called BenifiSense. It aimed to help adults with SPD self-regulate in over-stimulating environments. I found there was much more I could do in the area of SPD due to the uniqueness of an individual's sensory preferences and the relationship between different senses – especially as I learned more about the internal senses and their implications. The table below (Fig. 9.) describes the jacket, its purpose, effectiveness, and further opportunity.


BenifiSense	Description	Purpose	Effectiveness	Further Opportunity
	<p>Addressing the tactile, auditory, and olfactory senses. The lining of the jacket minimises the usage of seams. The hood regulates sound using damping foam layered under a sound-blocking polyester outer shell, with slots inside the hood allow the Bluetooth speakers to be inserted and adjusted. Scented bead pouches can be inserted into the pockets inside the mouth-covering.</p>	<p>To prepare adults with SPD, for environments where they may be prone to experience sensory overload.</p>	<p>While I consulted with an occupational therapist throughout the project, I didn't get to do any user testing on this jacket to validate its effectiveness.</p>	<p><i>Opportunity to explore more material options, address the internal senses and interact with user group.</i></p>

Fig. 9. BenifiSense Table, author's work

3.2 WHAT DESIGN CAN DO TO HELP ADULTS WITH SPD

There is currently a gap for modular, customisable, and wearable sensory products that can be utilised in environments where an adult wants to self-regulate and remain in while feeling empowered and comfortable. This led me to investigate how I could design a wearable that allowed the user to apply compression on their muscles and joints, that was more versatile and allowed for use when and where it is needed, and for it to provide multiple ways to interact with it, depending on the users' preferences.

Most environments are designed with neurotypical individuals in mind. This is where there is an opportunity for sensory clothing to help in those environments. "When we delve into our wardrobes, we probe into an intense sensory world that can either make our day incredible or treacherous" (Dunn, Living Sentionally 147). There is a wide variety of sensory products out there, but very few are suitable for adults that need to self-regulate in public spaces.

Utilising empathic design techniques allows garments to be designed in a way that addresses both tangible and intangible sensory processing challenges. Empathically designed garments address users' tangible, individual and unique sensory profiles while remaining aesthetically pleasant and less clinical in appearance. This, in turn, allows users to feel more comfortable and confident using these products instead of feeling as though they are wearing something specialised - drawing unwanted attention towards themselves. I want to create independence and confidence for adults with SPD to be able to cope in environments that may cause them discomfort or overwhelm them or where they may otherwise try to avoid.

Utilising multi-sensory design techniques allows garments to be designed in a way that can benefit a wide range of people with unique sensory preferences and needs so that they can self-regulate independently, regardless of their actual diagnosis. "Proprioceptive

input, for example, involves heavy work- pushing, pulling, lifting, and carrying. This can be calming for many of us. While many of these products are marketed as "autism toys", even neurotypical adults can benefit from their use. We all have different patterns of sensory integration or sensory processing that makes us unique and can benefit from support when under stress or trying to achieve a state of calm relaxation" (harkla.co; Holland).

I explored how wearable sensory design solutions and empathic design can be used to accommodate varied sensory profiles of adults with sensory processing difficulties. I am catering to adults that have their own sensory preferences and challenges, who may or may not have a diagnosis, and that want more independence and ways of coping with their unique sensory processing challenges in a discreet manner. I directed my focus on impairments in the more internal sensory systems of tactile, proprioception and interoception, and where

connected, use the other senses of visual, auditory, and olfactory to aid in the effectiveness of the designs. I wish to address current gaps in the market where a sensory garment could serve as an appropriate aid while considering the uniqueness of individual preference by making use of established methods (sensory profiles and patterns) to help inform design elements, design choices, and design processes (Dunn, Living Sensationally; Stokes and Black).

CHAPTER 4: METHODS

4.1 UNDERSTANDING THE USER – AN EMPATHIC DESIGN APPROACH

We only understand things based on what we know, and what we know is based on our own experiences, challenges, and learnings in life. Designers must seek inspiration and feedback from users to gain insight outside their own experiences when creating new products since users' experiences can differ fundamentally and significantly from the designer's.

McDonagh and Thomas (182) explain that this methodological approach is important for presenting the designer with perspectives that may differ from their own. My user research provided valuable insights from a neurodivergent perspective that I may have otherwise missed from a neurotypical lens.

Empathy can be described as the ability to recognise and relate to another person's thoughts and feelings (McDonagh and Thomas 183). Empathic design helps designers understand the users' perceptions and behaviours around products through engaging with

and studying users in their everyday environments, helping create more appropriate and successful design outcomes. It helps inform the desired qualities of a product while avoiding the generation of stigma to empower the user and reduce the risk of product abandonment – particularly for products that are assistive by design.

As a designer, this means being able to relate and cater to aspects beyond the user's tangible and functional needs and address the user's more intangible 'supra-functional' needs. This encompasses their emotional needs, motivations, values, priorities, and preferences (McDonagh and Thomas 181). The Empathic Design methodology and user-centric focus is the crux of the methods and processes of my thesis. "Rather than designing for the users, we need to be designing intimately with them" (McDonagh and Thomas 195).

4.11 The Functional–Expressive–Aesthetic (FEA) Needs Model

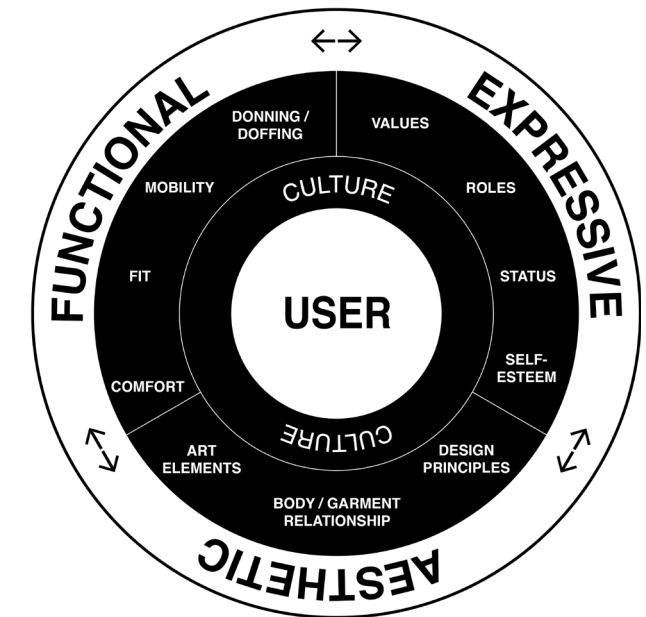


Fig. 10. Adapted from Lamb and Kallal, *FEA Needs Model*, July 2022, Research Article.

Fashion design educators Lamb and Kallal created a design framework called the Functional-Expressive-Aesthetic (FEA) Needs Model. Its primary purpose is to help students think of design in an empathic way that places the user's wants and needs at the forefront while balancing three intimately linked key aspects of design – function, expression, and aesthetic. This helps establish an effective design criteria that closely reflects the needs and wants of the user. This model supports the idea of merging functional and aesthetic design as a synergistic device when designing for individuals with disabilities (Lamb and Kallal). It aims to blend the practices of functional apparel design and fashion design, recognising that these two practices are not disparate and are both required to fulfil the desires of the user (Lamb and Kallal 43).

Functional aspects consider how the user interacts with the product and the product's ability to accomplish the tasks needed by the user. It is essential to consider

the users' interaction with the product, as they may interact with it in unique, unexpected ways, which can inform better fit for purpose design. Stokes and Black categorised the following tasks as 'significant considerations' for designers, creating garments for individuals with disabilities:

- Comfort
- Donning and Doffing
- Fit
- Mobility

(Stokes and Black).

Expressive aspects consider the user's desire for design that resonates with their values, status and innermost being—for example, consciously designing garments in a way that does not expose or stigmatise the users existing challenges, normalising their disabilities, and generating an increased sense of self-confidence and self-empowerment.

Aesthetic aspects consider the overall beauty and appearance of the product (Stokes and Black). Aesthetics can help create a sense of belonging or help users identify with a particular culture or persona – invoking a greater sense of self-confidence and self-awareness, which has been proven to be a useful and powerful strategy for those with SPD (Stokes and Black).

Applying the FEA model in the context of designing clothing, we can better design a garment that can fulfil a core functional purpose while remaining inconspicuous and even aesthetically desirable as an aid. "It places emphasis on needs from the perspective of the end user and seeks to identify and mitigate potential problems based on the varying conditions set by the user's context" (Chan and Lempp). This informed my design criteria and helped evaluate the prototypes' effectiveness in relation to the established criteria.

4.12 Methodology

I utilised Tim Brown's Design Thinking model to better understand and design for the users, using the following approach shown below (Fig. 11.) This is a non-linear process (Brown) in which various methods were used to involve the user.

The stages informed the design process:

- **EMPATHISE** and understand the challenges of the user
- **DEFINE** and identify the needs of the user
- **IDEATE** and conceptualise innovative solutions
- **PROTOTYPE** and create the physical representation of my ideations
- **TEST** and iterate prototypes to improve on design and continually tailor to the needs of the users
- and to **IMPLEMENT** and generate a user-centric, empathically designed final product.

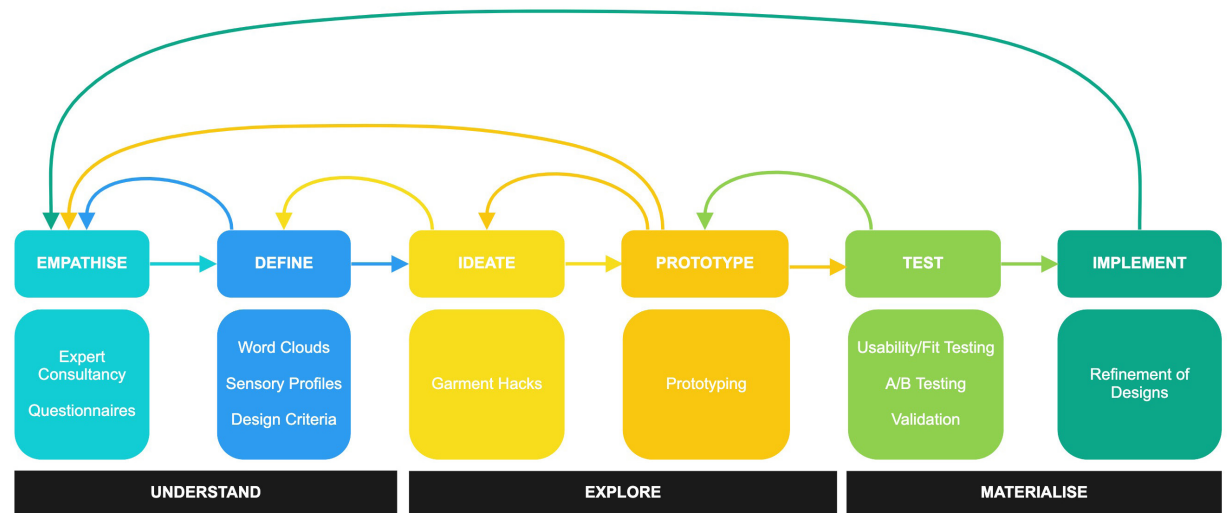


Fig. 11. Adapted from Brown, *Design Thinking Model*, July 2022, Research Article.

4.2 EMPATHISE:

4.21 Expert Consultancy

Because of the lack of research around SPD, I wanted to talk to experts who had experience working with various individuals affected by sensory processing challenges. During my Bachelor of Design project, I met Diane Strugnell, a local occupational therapist who became involved with my Master of Design project. Her expertise was in sensory integration-based therapies for children with sensory challenges. Her experience and practice expertise helped me better understand the complexities and individual presentations of SPD. One thing that Diane always emphasised is that everyone's sensory profiles are very unique. So, strategies that work for one person may not necessarily work for another - this highlighted the need for modular design.

Diane explained the usefulness of compression versus weighted clothing. In her experience, compression clothing was more helpful as it provides more consistent pressure, moving with the body and not slipping around. This inspired deep touch pressure to be a prominent feature of my designs. She also described how proprioceptive and tactile receptors use the same sensory pathway to the brain. For example, proprioceptive activities or applications such as deep touch pressure can be used to calm those who are exceptionally sensitive to touch or are tactile defensive. This confirmed the relevance and importance of multi-sensory design. The insight from these discussions heavily influenced my research aims, helping me to identify gaps, validate my early design concepts and realise the real-world relevance of my garment.

4.22 Questionnaires

To help me better empathise with the users, I utilised anonymous questionnaire-style surveys, following Massey University Low-Risk ethics procedures. I invited members of online SPD support groups to partake in a set of questionnaires. Users were informed what the results would be used for, ensured their identities and responses would be kept anonymous and safe and were not obliged to complete any question they were uncomfortable answering.

Based on key findings from my secondary context review, the questions asked users to describe their background, behaviours, experiences, challenges, and sensory product and environmental preferences. This comprised mainly open-ended questions to allow for qualitative feedback and a few multichoice, Likert scale questions (see Appendix B) to understand the strength of agreement for a particular question (Martin and Hanington).

The results helped me gauge the differences across a wide range of adults, notice trends and identify common issues and gaps that were not being met by the current market offerings. Common sensory needs and preferences informed my design criteria – qualities commonly desirable were considered requisites and features commonly undesirable were left out. When a feature was liked by some and disliked by others, it was then designed to be modular.

Limitations

Across the questionnaires, there was a significantly small number of male respondents. This depended on the demographic of the pages' membership and may not be entirely representative of all with the condition.

Findings – Garment Qualities and User Preferences:

“Imagine a garment/item of clothing you find comfortable. Rate these features in terms of importance to you” was the most important multi-choice question asked as this directly influenced my design criteria. As seen in the figure below (Fig. 12.), ‘stretchy’, ‘loose fit’ and ‘soft’ were the most valued garment characteristics by the respondents – with ‘breathable’, ‘lightweight’ and ‘not noisy’ closely behind.

These findings were also reflected in the responses to the question “Describe your favourite item of clothing. What features of the garment make it appealing for your comfort?” (see Appendix C), and further preferences were identified in the responses to “Are your fine motor skills affected by your SPD? Do you struggle with any particular fastenings on clothing?” (see Appendix D).

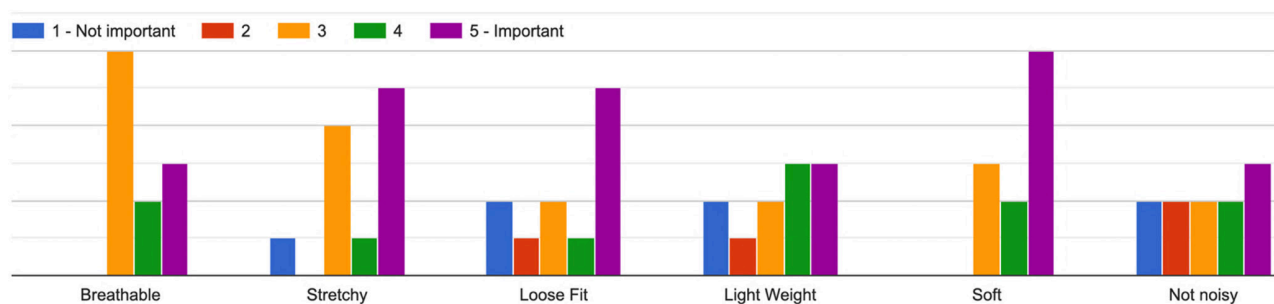


Fig. 12. Responses to “Imagine a garment/item of clothing you find comfortable. Rate these features in terms of importance to you”, author's work

4.3 DEFINE:

4.3.1 Visualising Data: Word Clouds

I used a Word Cloud generator to quantify and visualise the responses to the open-ended questions. Word Clouds work to identify trends by rendering chosen keywords bigger and bolder the more frequently it is mentioned. This required manual filtering to manage the typos and ensure consistency across answers.

Affected Senses:



Fig. 13. Responses to "Which of your senses does your SPD affect the most?" visualised in a word cloud, author's work

The results show that sound is the most affected sense, and touch second (See Appendix E). While this word cloud shows sound as the most affected sense, and touch second, the following word clouds show the significance of touch as a main affected sense. Therefore, I decided to focus on touch – it presented an accessible gap in the current market and was the most practical sense to implement sensory modulation applications in a garment to facilitate positive change in users.

Garment Qualities and User Preferences:



Fig. 14. Responses to "Describe your favourite item of clothing. What features of the garment make it appealing for your comfort?" visualised in a word cloud, author's work

Participants identified what features of the garment made it appealing for their comfort (See Appendix C). Amongst most users, I found that:

- The most preferred fabric was cotton, with many having an aversion towards wool and synthetics.
- Softness was a highly desirable characteristic, with an aversion to the use of fastenings.
- Fit was important, with responses favouring loose fit that did not restrict movement.
- It is interesting to note the number of responses that suggested loose fit around the neck as preferable – I noticed this to be a common theme throughout when studying the word clouds.

Seam Placement and User Preferences:



Fig. 15. Responses to "What specific areas on the body do clothing seams irritate you the most?" visualised in a word cloud, author's work

Some users identified the importance of seam placement and their feelings towards specific contact point areas (see Appendix C, and Appendix F). In addition, I created a body map (Fig. 16) to highlight the touchpoints on the body that adults with SPD wanted to avoid seam contact with, (highlighted in green as an area where contact was undesirable).

I applied this when designing the panels and considering the seam placement of my garment to avoid unnecessary contact with these areas. Again, the neck was identified as a common pain point.

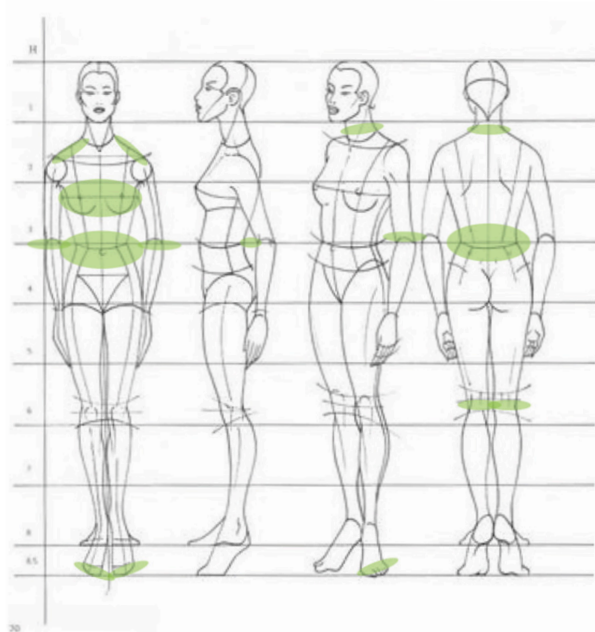


Fig. 16. "What specific areas on the body do clothing seams irritate you the most?" visualised in a body map, author's work

Related Conditions:



Fig. 17. Responses to "Do you have any other conditions along with SPD?" visualised in a word cloud, author's work

From this question, the most common conditions associated with SPD were ADHD, Autism, Depression, Anxiety and OCD (See Appendix G). This was in line with and confirmed my secondary research findings. This prompted me to look further into the common overlapping symptoms experienced by people with coexisting conditions to see how my garment could be more universal and inclusive in its design. These included: fidgeting, hypersensitivity to sensory stimuli, depression, stress, and anxiety.

Most Used Sensory Products:

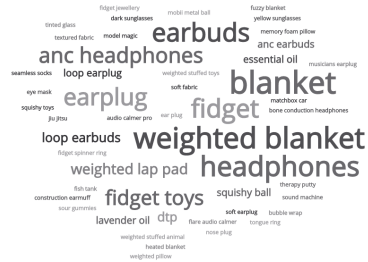


Fig. 18. Responses to “Do you currently use any sensory products to help manage your condition?” visualised in a word cloud, author’s work

The results showed that weighted blankets were the most used sensory product. This suggested a gap in appropriate proprioception/DTP products that can be utilised in stress-inducing environments. One respondent’s comment highlighted the need for a weighted product to use during the day (see Appendix H).

Other Notable Responses:

How the users currently manage their condition. These activities were:

- Practising mindfulness – deep breathing.
- Preparing before entering the environment.
- Removing themselves from the environment.
- Avoiding environments that may cause them discomfort, stress, or anxiety.
- Blocking out the stimuli.

There wasn’t much overlap in the occupations of these individuals, but in some cases their work area environments were not easily adaptable – therefore, I want to design products that they can take into these environments that can prepare them for sensory stress.

“[I work in] Healthcare I wear scrubs which I have either modified or wear layers with to accommodate my clothing sensitivity.” [Response from 31-40, Female, respondent to Questionnaire, 17 Nov. 2021]

Users gravitated towards more muted and simple colours, some with an aversion to bright colours (see Appendix C).

“Basic solid colours, navy, white and golden/mustard. Bright colours are often very off putting visually so I like the simplicity of it.” [Response from 18-25, Non-Binary/Fluid, respondent to Questionnaire, 1 Oct. 2021]

4.32 Adult/Adolescent Sensory Profiles

To help me define and identify the needs of the user, I utilised the AASP to create sensory profiles for each of my user testers – this further informed the development of my design criteria and helped me to identify a range of different profiles and how I can design for each, in one product, without being restrictive or forcing the user to interact with it in a particular way. I reached out on the SPD group to find interest in user test participation.

Participant Criteria

The user testers all filled out an Adult Sensory Profile self-questionnaire; the profiles were evaluated through a standardised and non-standardised method to determine where their behavioural and neurological responses sit on the sensory quadrants. The non-standardised method analysed their answers based on the responses of the individual sensory systems. Half of my respondents had an SPD diagnosis (along with ASD and/or ADHD), and the other half were either self-diagnosed, experienced heightened anxiety, PTSD, OCD, or had sensory preferences that made clothing challenging for them – this validated how my design could be helpful to a broader audience.

Sensory Profile Analysis

I worked with Diane to analyse the profiles and make sense of what the results meant. We speculated on the accuracy of some responses. This was important as, in some cases, the statements were double negative or were contradictory, e.g. I don't notice when my name is called being answered as Almost Never can be a confusing statement. This highlighted the importance of discovering an individual's unique sensory preferences by discussing their experience or observation. There are always exceptions behind responses or behaviours, e.g. if they are "much more than others" in the sensory sensitivity quadrant, they may still use strategies (typically seen as sensory seeking) like fidgeting to block out unwanted stimuli from other senses.

Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	4	4	2	2	3	4	1	1	5	1	5	5	3	4	4	3	1	3	2	5	1	4	1	4	4	3	5	3	1	1	1	4	5	3	5	1	5	4	1	2	5	2	5	5	4	4	1	3	4	2	5	3	3	4	2	4	5	4	2	3			
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	45															34															54															57																	
Result	Much More Than Most People															Much Less Than Most People															Much More Than Most People															Much More Than Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	5	1	2	1	5	1	4	1	5	3	4	5	3	2	4	5	1	4	2	5	5	4	4	4	4	4	5	5	2	5	1	3	2	5	5	5	1	5	5	1	4	4	4	4	3	4	5	5	1	5	5	3	5	5	5	5	5	1	5	5			
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	56															29															68															70																	
Result	Much More Than Most People															Much Less Than Most People															Much More Than Most People															Much More Than Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	5	3	1	1	4	2	4	1	3	5	2	4	2	5	3	5	3	2	3	2	3	5	1	4	5	5	1	1	4	2	3	3	5	5	4	1	5	3	1	2	5	1	4	3	4	4	4	5	4	4	5	4	4	5	4	3	5	2	5	5	1	3	5
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	42															39															60															58																	
Participant	[Name removed for confidentiality]																																																														
Result	More Than Most People															Less Than Most People															Much More Than Most People															Much More Than Most People																	
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	5	5	1	2	4	2	4	5	5	3	1	4	2	3	3	4	1	5	2	5	2	5	3	5	5	5	4	5	4	3	5	5	5	4	4	3	5	5	3	1	5	1	4	5	5	1	5	5	4	4	5	5	3	5	5	3	5	5	3	5	5		
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	53															45															67															67																	
Result	Much More Than Most People															Similar To Most People															Much More Than Most People															Much More Than Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	3	2	4	3	4	2	3	4	2	5	3	5	2	3	4	5	3	3	5	3	4	3	3	4	3	1	1	2	4	4	3	2	5	3	4	5	3	3	4	4	3	3	2	2	3	3	4	4	3	4	3	2	4	3	4	3	3	2					
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	51															49															48															46																	
Result	Much More Than Most People															Similar To Most People															More Than Most People															More Than Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
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Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	40															51															38															30																	
Result	More Than Most People															Similar To Most People															Similar To Most People															Similar To Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
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Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	46															51															58															54																	
Result	Much More Than Most People															Similar To Most People															Much More Than Most People															Much More Than Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
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Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	45															49															37															37																	
Result	Much More Than Most People															Similar To Most People															Similar To Most People															Similar To Most People																	
Participant	[Name removed for confidentiality]																																																														
Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Raw Score	2	3	4	4	2	1	1	4	3	1	5	1	2	4	3	3	4	2	2	4	1	5	2	3	3	1	5	2	3	3	1	2	3	4	3	3	4	5	5	3	5	3	2	4	4	5	3	5	5	4	2	3	4	4	2	4	5	2					
Quadrant	Q1 - Low Registration															Q2 - Sensation Seeking															Q3 - Sensory Sensitivity															Q4 - Sensation Avoiding																	
Quadrant Score	58															50															37															42																	
Result	Much More Than Most People															Similar To Most People															Similar To Most People															More Than Most People																	

Fig. 19. Self-Questionnaire Results of User Group, author's work

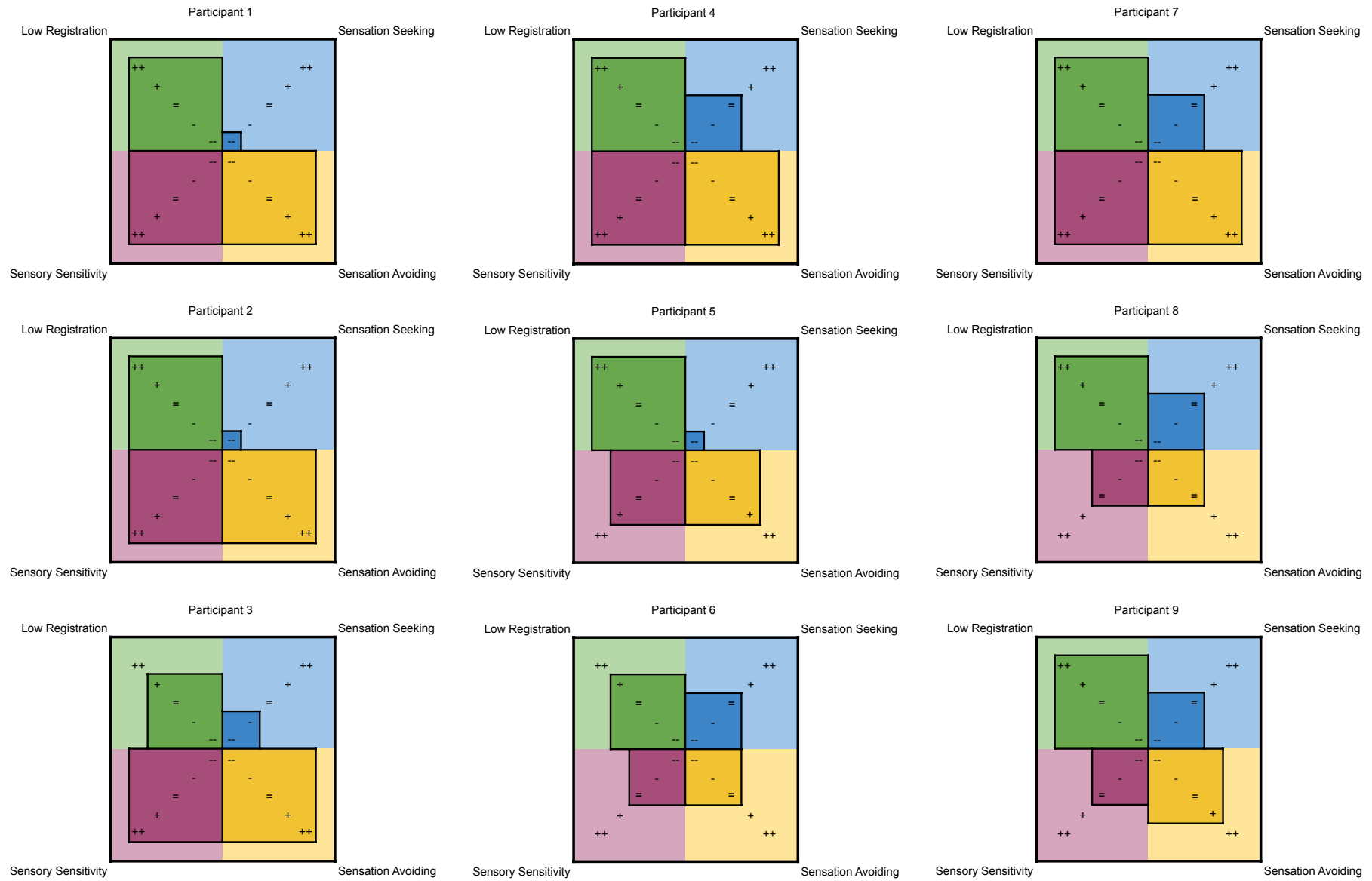


Fig. 20. *Sensory Profiles of User Group, author's work*

The results of all the gathered sensory profiles revealed the following:

- Seven of the nine participants were “much more than most people” regarding Low Registration, as seen in the Sensory Profiles above (Fig.20.). While this was the most consistent quadrant result across all the profiles, it was decided that this was a behavioural response that could not be catered for in a wearable solution, as it had the most variables factoring into this result. For example, not noticing when your name is called could be due to difficulty hearing or distraction from the environment. For the most part, the interventions for this type of behaviour are more social and could not be applied in a wearable solution.
- Despite Sensation Avoiding and Sensory Sensitivity being the second most common result, they were the most practical quadrants to design for in a garment.

4.33 Design Criteria

My design criteria remained fluid throughout the research stage, going through several iterations as I gained more insight from my user group. This informed the development of my designs – especially as I started interacting with the user group and hearing how they were dealing with their unmet needs and daily struggles. Using quantitative data from the questionnaires, I was able to filter out consistencies vs outliers. For example, I was able to roughly quantify the data using word clouds. Through the open-ended questions, I was able to get qualitative responses and identify challenges that I hadn’t considered or come across in my secondary research. For example, many respondents’ preference for a loose neckline.

My initial design criteria was informed by the findings of my secondary research, expert consultancy, and questionnaires. Informed by the FEA model, “Identifying user needs and wants provides a means for establishing design criteria. In our model these are classified as functional, expressive, and aesthetic. The specific concerns within each category vary with different users/ markets” (Lamb and Kallal 43). The categories that fit

under “Functional” were Tactile Comfort and Calm and Focus; “Expressive” there was Flexibility; and “Aesthetic”, Discretion.

At this point in my process, I realised the need for me to revisit the definition of Universal Design, to help further refine my design criteria. I took careful consideration to address the underlying condition while remaining functional and desirable to those who may not have the condition.

These were the key principles of Universal Design I found that could and should be used in my project, which I used to inform the updated design criteria:

- Flexibility in use
 - Simple and intuitive use
 - Low physical effort
- (Preiser and Smith; Park et al.).

TACTILE COMFORT	<ul style="list-style-type: none"> • Reducing discomfort from sensitive touch points on body - be considerate of seam and panel placement. • Inclusion of lining. • Softness of material.
CALM AND FOCUS	<ul style="list-style-type: none"> • Facilitation of compression, to be applied where and when needed by the user. • Deep Breathing cues - to create calm and encourage mindfulness.
DISCRETION	<ul style="list-style-type: none"> • Must appear as regular clothing. • Interaction with the garment must be discreet. • No bright or crazy patterns that could overstimulate the user.
FLEXIBILITY IN USE	<ul style="list-style-type: none"> • Ability to customise to suit the individual needs of the user - modular and customisable garment components for individual needs.
SIMPLE AND INTUITIVE USE	<ul style="list-style-type: none"> • Donning and doffing must be easily understood by the user.
LOW PHYSICAL EFFORT	<ul style="list-style-type: none"> • Fastenings can be utilised with reduced fine motor skills • Not more than five fastenings in a row, not small or fiddly

Fig. 21. *Design Criteria*, author's work

CHAPTER 5: DESIGN PROCESS

5.1 IDEATE: EXPLORING WEARABLE SOLUTIONS THROUGH USER-CENTRIC DESIGN

5.11 Garment Hacks: Idea Validation

In response to the survey findings, I decided to do a 'garment hack' of existing garments. Initially, I looked at hoodies because it was one of the favoured garment types identified by the respondents. The respondents highlighted the dislike for seams against certain areas of the body. There were many important considerations when designing sensory-friendly clothing, including material choice, seam placement, type of garment, weight, and fastenings.

Garment Hack #1

The first garment hack was done on a fitted unlined cotton zip-up women's hoodie. I started by turning the hoodie inside out to see what seams contacted the body, what seams could be eliminated, and how the fit of the hoodie could be altered to reduce contact between the body and the fabric. For this initial exercise, the intention was to test and validate ideas quickly. The first irritating point of contact was identified between the elbow and the seams on the sleeves that run along the arms, especially when the arm was bent. I reduced this contact by adding a continuous gusset under the arm, which loosened the sleeves, shifting the seams away from the elbows and added width to the torso.

The garment hack explored two extremes in fit, one side being more fitted (pink) and following the form of the body, and the other (green) being more voluminous and baggier. On the left side of the garment, I went for a kimono-style sleeve (green) – eliminating the shoulder seams and exaggerating the loose fit, which is the preferred fit identified by most of the users. In direct response to the results from the first survey (which identified areas users preferred less contact from clothing), I removed the elastic cuffs and waistband from the jacket. I found that the addition of the green layer over the existing (pink) jacket pocket hid the user's actions when their hands were placed inside. This would be a suitable way to hide interactions with elements on a garment to allow for discreet fidgeting.

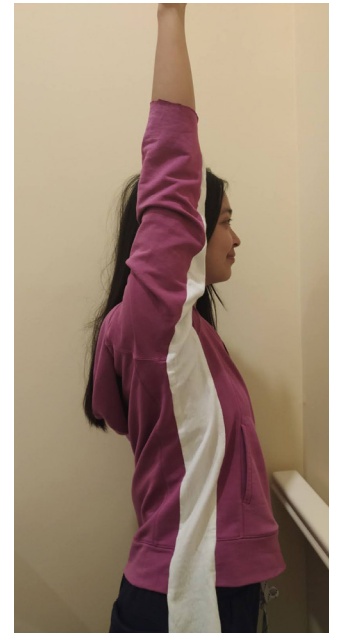


Fig. 22. *Garment Hack #1*, author's work

Garment Hack #2

In response to results from the questionnaire question: Do you notice any particular positions, body movements etc. that you make when you are in a stressful/overwhelming environment? I found that many people liked to apply pressure on their hands, whether clenched together in a fist, sitting on them or having them under their arms. This aligned with my secondary research on joint compressions, where I found that applying compression to the muscles and joints was an effective tool for providing calm.

I lined specific areas of the hoodie (shoulders, elbows, and wrists) with compression material – this allowed for the facilitation of compression to be applied where and when needed by the user. I wanted to redesign and test pockets that would allow for discreet interaction inside. I found many pockets on jackets tend to be relatively small, not very discreet and noticeable when hands are inside. The addition of a compression layer in between the pockets allowed for a discreet yet accessible touchpoint for the user to interact with and apply pressure on hands when needed. A compression layer between the elbows was sewn in to allow the user to apply pressure on the elbow joints and fists when required. This was inspired by the act of self-hugging and arm crossing – both common, innate, and natural self-regulatory behaviours.



Fig. 23. *Garment Hack #2*, author's work

5.2 PROTOTYPE

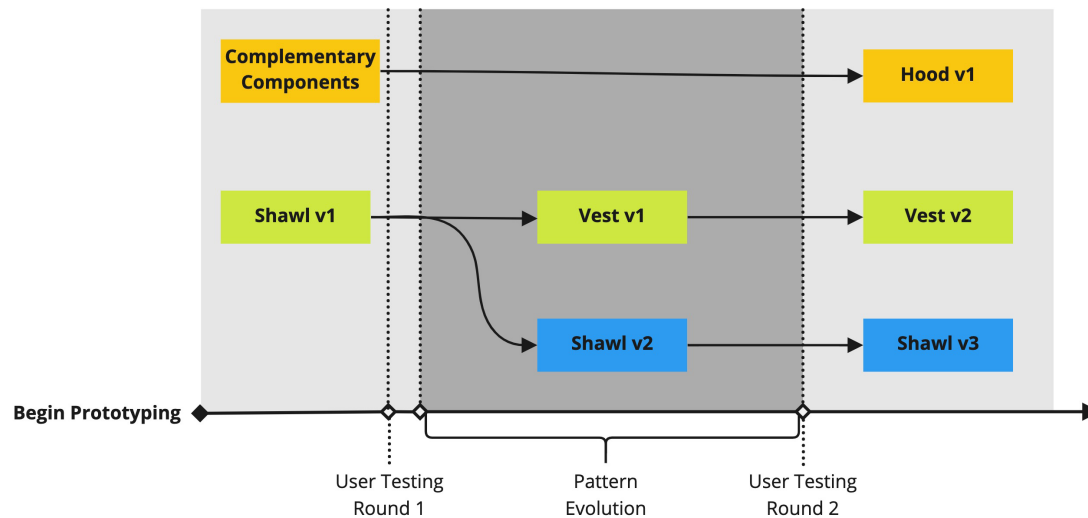


Fig. 24. *Prototype Timeline*, author's work

5.2.1 Hooded Shawl

The overall design of the hooded compression shawl was inspired by compression bands, the body's posture response to stress, discomfort, and anxiety, and one of the garment hacks. I wanted to see if there was a way of effectively applying DTP in a wearable that wasn't inflatable or weighted – so it could easily be adjusted to the user's preferences without removing the garment. This concept aimed to address the need for deep touch pressure in a wearable that did not appear specialised or clinical. The components that made up the shawl were informed by my design criteria and are described in the table on the following page (Fig. 25.).




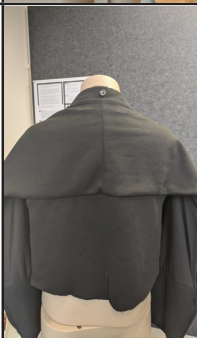
<p>TACTILE COMFORT</p>	<p>Seam Placement</p> <ul style="list-style-type: none"> The rectangular shape of the garment meant that there was minimal seam contact with the body. <p>Material Choice</p> <ul style="list-style-type: none"> Polycotton jersey knit, and lycra were used as main materials for its softness and stretch. 	
<p>CALM AND FOCUS</p>	<p>Compression DTP</p> <ul style="list-style-type: none"> Compression lining activated by applying downwards force into the front pockets, to provide compression on the shoulders. Option to wrap the shawl around the users' arms to activate the compression on the elbows too. 	
<p>FLEXIBILITY</p>	<p>Modular Components</p> <ul style="list-style-type: none"> Detachable hood to allow for flexibility of wear. Chew/fidget attachments that can be snapped onto the ends of the drawstrings. To allow the user to choose what they want to attach to the ends – jewellery or a fidget toy. <p>Fastenings</p> <ul style="list-style-type: none"> Buttons on the collar of the vest, facilitate the attachment of the hood. 	
<p>DISCRETION</p>	<p>Aesthetic</p> <ul style="list-style-type: none"> Doesn't appear like a specialised compression garment. 	

Fig. 25. Hooded Shawl Features, author's work

5.22 Complementary Components: Hat/Hood

This concept aimed to address users' need to regulate sound and a preference for keeping their ears covered without the pressure or discomfort caused by headphones or earbuds. It was important for the design to be modular and able to be used on its own while having the option to be attached to the main garment by buttons. It would use sound regulating materials and allow low-profile Bluetooth speakers to be fitted into the side to help regulate sound. The hat and the hood were separate ideas to begin with, but I discovered that it would make more sense to combine the two into one. The detachable hood was inspired by the hood on my BenifiSense jacket and its use of sound-regulating material to manage auditory stimuli. However, this lacked the modular aspect and did not consider the garment care instructions – specifically, how would the jacket be washed? The sound regulating materials used in the hood required particular care as they can't be put into the wash. Therefore, the idea came to have it be detachable from the shawl – this meant the user could choose if they wanted to use the hood or not.


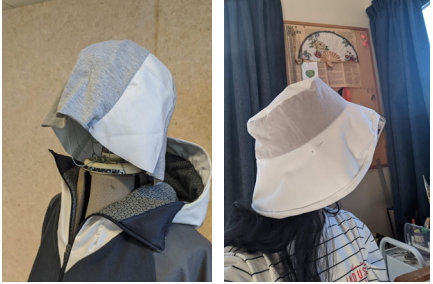


<p>TACTILE COMFORT</p>	<p>Seam Placement</p> <ul style="list-style-type: none"> The hoods and hats are lined to reduce uncomfortable seams against the head. 	
<p>CALM AND FOCUS</p>	<p>Slots</p> <ul style="list-style-type: none"> Allow Bluetooth speakers to be inserted into the hood for the user to block out unwanted noise with their preferred sounds. 	
<p>FLEXIBILITY</p>	<p>Fastenings</p> <ul style="list-style-type: none"> Hat can be adjusted to suit multiple head sizes with a cord lock. <p>Modularity</p> <ul style="list-style-type: none"> Can be worn on its own as a hat or attached to the shawl as a hood 	
<p>DISCRETION</p>	<p>Aesthetic</p> <ul style="list-style-type: none"> Appears like a regular hood or hat <p>Material</p> <ul style="list-style-type: none"> Bluetooth speakers are hidden, so are more discreet than wearing traditional earmuffs 	

Fig. 26. Hat/Hood Features, author's work

5.3 TEST

5.31 User Testing Round 1: Usability Fit Testing

I wanted to gain more insight and verify the findings from the users' sensory profile results during initial user testing by observing how each person responded to the garment and its features.

Participant Criteria

All six user testers took the Adult/Adolescent Sensory Profile self-questionnaire beforehand to identify their sensory profiles. The profiles of the participants all indicated Low Registration, Sensation Avoiding and Sensory Sensitivity as their top quadrants.

Procedures

I invited users to try on the garments to validate their usability and fit. I chose to do user testing individually rather than as a group so that no person's response would influence another's comments or opinions. I asked each person the same set of questions and noted down their responses; these centred around the FEA Model and were categorised as Functional, Expressive, and Aesthetic:

FUNCTIONAL

1. *How effective is the pressure through this application?*
2. *Which of your senses are affected the most?*
3. *Do you currently use any products to help you cope in stressful or overwhelming environments?*

EXPRESSIVE

1. *Does the garment look specialised in any way? If so, what elements make it appear that way?*

AESTHETIC

1. *What are some garments or products you use that you find comforting?*
2. *When would you wear it? Would you consider it more casual, dressy etc.?*

Feedback – Usability Fit Testing

The following are the responses to the FEA questions asked, which helped me empathise with my user group:

Question	Response(s)
FUNCTIONAL	
How effective is the pressure through this application?	<ul style="list-style-type: none"> The users found the pressure on their shoulders really calming Some commented that the pockets were a bit too low for applying the ideal amount of pressure.
Which of your senses are affected the most?	<ul style="list-style-type: none"> Sound and Touch were the most affected
Do you currently use any products to help you cope in stressful or overwhelming environments?	<ul style="list-style-type: none"> A long gem shaped chew necklace Earbuds and headphones
EXPRESSIVE	
Does the garment look specialised in any way? If so, what elements make it appear that way?	<ul style="list-style-type: none"> Having no back makes it appear a bit specialised.
AESTHETIC	
What are some garments or products you use that you find comforting?	<ul style="list-style-type: none"> One user owned a vest that they found quite comfortable – they often kept their hands in the front pockets because they found the pressure it generated calming.
When would you wear it? Would you consider it more casual, dressy etc.?	<ul style="list-style-type: none"> Users commented that it appeared quite versatile and could imagine it being dressed up or worn casually like a scarf. Users found the contrast lining on pockets and hood attractive. Reminded users of 'Japanese street fashion.'

Fig. 27. FEA User Tester Interview Questions, author's work

TACTILE COMFORT	<ul style="list-style-type: none"> • Everyone liked the fabric choice for the main body and the collar for their softness. • The pocket lining had quite mixed preferences – an area that could be made modular. • Most users preferred having their backs covered – for some, this was related to warmth, and for others, an open back made them feel exposed.
CALM AND FOCUS	<ul style="list-style-type: none"> • Four of the six users mentioned deep touch pressure over their shoulders to be instantly calming. • “I never noticed, but that’s probably why I like having my hands in my pockets when I’m wearing a vest.”
FLEXIBILITY	<ul style="list-style-type: none"> • A couple of user testers mentioned they liked that the shawl could be worn multiple different ways to add compression to different parts of the body.
DISCRETION	<ul style="list-style-type: none"> • Most users liked the aesthetic of the shawl, but one user thought the unconventional back appeared a bit specialised and more feminine.

I assessed the observations made against my design criteria. This helped validate the effectiveness of the different components of the garment and the results of the testing. The table to the left (Fig. 28.) summarises these observations.

Reflections and Responding to Feedback

It wasn’t exactly apparent to the user that you could wrap the shawl over your elbows (in the darts) - this meant I would need to change the shaping to help users know where areas of interaction were. This highlighted the importance of semantics and having an intuitive design. Some other considerations were the reduced fine motor skills of people with dyspraxia - this meant I would need to consider the size of buttons and investigate alternative fastenings.

This led me to update my Design Criteria to reflect and consider these points.

The mixed response to the different pocket linings indicated that a person’s perception of fabric softness could vary greatly. I wanted to incorporate a modular element into the garment to cater for this. Some users suggested that adding weights to the front pockets could be a way to apply downwards pressure. A common theme was the comfort/calm from the compression and the preference for a covered back, which led me to develop a vest.

Fig. 28. Usability Fit Testing - Feedback, author’s work

5.4 USER TESTING ROUND 2: A/B TESTING

This activity was a pivotal milestone in my project. I iterated my design (Shawl v1) based on the feedback from the first set of user tests, which resulted in two garments – a vest (Vest v1) and a shawl (Shawl v2). I created three versions of the vest and two versions of the shawl, each with different characteristics, to help distinguish the best combination of materials, construction, fit, and implementation of sensory modulation techniques.

Procedures

I invited users to try on the garments to validate different versions of the shawl and vest and rate the different versions in terms of their effectiveness at achieving different aspects of my design criteria. This was done with the same user testers from the first round. This again was done individually rather than as a group.

5.41 A/B Testing – Vest

The following table (Fig. 29) outlines the design components of the three vests:




<p>VEST FEATURES</p>	<p>Vest #1</p> 	<p>Vest #2</p> 	<p>Vest #3</p> 
<p>TACTILE COMFORT</p>	<p>Crew Neck – Comfort, Control point for balance. Allows for more coverage of the chest area and helps the vest to sit on the body better when it is not connected at the sides. No shoulder seams. Orientation of the front panels on this pattern gave this vest the boxiest shoulders out of the three. Fully lined to reduce areas of contact with seams – adds weight.</p>	<p>Lower V Neck - reduces contact between the neck and the collar. No shoulder seams. The more obtuse orientation of the front panels on this pattern gave this vest the more relaxed shoulders in comparison to Vest #1 Fully lined to reduce areas of contact with seams.</p>	<p>Lower V Neck - a similar silhouette to Vest #2, but with triangular panels that could be utilised to reduce bulk when adding pockets – inseam rather than jet pockets. No shoulder seams.</p>
<p>CALM AND FOCUS</p>	<p>Fully lined with the scuba knit which makes this the heaviest vest of the three. This helps reduce the contact between the inside seams and the body.</p>	<p>I explored a hands-free approach to DTP that was easily adjustable, from this, came the idea for a compression belt. The belt attaches to the vest, not only as a way of locking in the downwards pressure on the upper torso, but to allow the user to apply pressure on their stomach. Made from the same material as the vest lining for its strength and effectiveness at providing compression and resistance.</p>	<p>Lined with the scuba knit on the top half (covering the shoulders down to the waist).</p>

Fig. 29. A/B Testing - Vest Features, author's work

<p>DISCRETION</p>	<p>Snap Closure Side Plackets: Adjustable fit loose or closer to body Access to inside pockets</p> <p>Pockets: Looser outer layer allows for discreet pocket interaction</p>	<p>Snap Closure Side Plackets: Adjustable fit loose or closer to body Access to inside pockets</p> <p>Pockets: Inner and outer pockets can be used to apply DTP on to upper torso.</p>	<p>Triangular centre front panels allow for discreet inseam belt and pocket openings. This would make the slits for the compression belt more discreet.</p>
<p>FLEXIBILITY IN USE</p>	<p>Option to be worn open for a loose fit.</p>	<p>Detachable belt allows user to add if needed or omit if not - double purpose as a scarf.</p>	<p>Option to be worn open for a loose fit. Belt can be attached for compression around waist.</p>
<p>SIMPLE AND INTUITIVE USE</p>	<p>PVC wrapped neodymium magnets - the garment can be washed without worrying about rusting overtime.</p> <p>Intuitive donning and doffing for people with reduced fine motor skills (e.g., Dyspraxia)</p> <p>Can be worn L over R and R over L - doesn't dictate gender.</p> <p>I also utilised the properties of magnets and alternated them at each step to avoid misalignment of the centre front and reduce frustration.</p> <p>The sides of the vest feature plackets that have snap closures on them - a fastening that is easy to use and remove.</p>	<p>Snap Closure Side Plackets The sides of the vest feature plackets that have snap closures on them - a fastening that is easy to use and remove.</p>	<p>Single toggle and button closure at the top of CF opening - reduce number of fastenings while still allowing for easy removal.</p>
<p>LOW PHYSICAL EFFORT</p>	<p>Discreet centre front magnetic closure for ease of fastening and quick removal.</p>	<p>No centre front closure, with the option of side snap closures to adjust fit - wear as poncho or pullover vest.</p>	<p>Single toggle closure to reduce excessive fastenings.</p>

Fig. 29 (continued). A/B Testing - Vest Features, author's work

A/B Testing – Vest Rating Chart

This chart (Fig. 30.) displays each user's rating of the main components of the vests in order from 1 being most effective to 3 being least. The total of each section determined the effectiveness of each vest in each category – the lower being the most effective. These have been circled.

At this point, I had updated my design criteria to include: flexibility in use, simple and intuitive use, and low physical effort.

	Comfort: Neckline	Comfort: Fabric	Calm: Effectiveness of Compression	Intuitive: Donning & Doffing	Low Physical Effort: Fastenings	Discretion: Interaction with Garment
Vest #1	2 3 1 1 1 2	1 3 2 3 3 3	2 3 1 3 1 2	1 2 1 1 1 1	2 1 2 1 2 1	3 1 2 1 1 1
Vest #2	3 1 3 3 2 1	3 1 3 2 2 2	1 1 2 1 2 1	2 1 3 3 2 3	1 3 3 2 3 2	2 3 1 3 3 2
Vest #3	1 2 2 2 3 3	2 2 1 2 1 1	3 2 3 2 3 3	3 3 2 2 3 2	3 2 1 3 1 3	1 2 3 2 2 3

Fig. 30. A/B Testing - Vest Rating Chart, author's work

Vest User Feedback:

TACTILE COMFORT	<ul style="list-style-type: none"> Soft knit liked by everyone Crew Neck feels most secure - sits better on chest; allows more surface area for compression over the chest.
CALM AND FOCUS	<ul style="list-style-type: none"> Vest #2, the DTP was instantly calming for most users "The compression on the waist is really nice." The weight of the Vest #1 is calming
DISCRETION	<ul style="list-style-type: none"> Vest #1 was the most discreet in its look and interaction with components.
FLEXIBILITY IN USE	<ul style="list-style-type: none"> Detachable elements are great, which means people can customise as sensory profiles are unique.
SIMPLE AND INTUITIVE USE	<ul style="list-style-type: none"> Side Closures on Vest #1 make it clearer how to put on Donning and doffing the garments still isn't clear - due to unconventional garment types/multiple openings/open sides
LOW PHYSICAL EFFORT	<ul style="list-style-type: none"> Magnets are great and double as weights and fidgets - for dyspraxia or ease of use Does not dictate gender, can be done L over R or R over L

Fig. 31. A/B Testing - Vest User Feedback, author's work

User Suggestions:

- Vest #2 Compression belt - option to make modular and removable so user can decide how it is used. Consider tapering belt, so the knot isn't bulky.
- Magnets - potential to interfere with delicate electronics (pacemakers, watches etc.) and other metallic objects (wheelchairs, keys etc.)

Reflections and Responding to Feedback

Testing out the three vests side by side was a great way of comparing and highlighting the pros and cons of the different components. Feedback gained was a mix of functional, expressive, and aesthetic considerations. Using a rating chart was a great way to visualise and quantify this data and inform decisions for the refinement of the vest. As Vest #1 had the most pros overall, I based the refined vest on this. From observing the users donning the vests, it became clear that it still wasn't 100% obvious how to put on each garment.

5.42 A/B Testing – Shawl

The following table (Fig. 32) outlines the design components of the two shawls:

SHAWL FEATURES

Shawl #1



Shawl #2



TACTILE COMFORT

Minimal seam placement: The fully lined rectangular shape of the pattern reduces contact with seams against the body.

Intentional seam placement over areas that are less obtrusive.

CALM AND FOCUS

Lined with four way stretch lycra for its flexibility and to provide compression on body when stretched.

Lined with the scuba knit for its strength and effectiveness at providing compression and resistance.

Fig. 32. A/B Testing - Shawl Features, author's work

DISCRETION	Inside pockets allow user to apply compression on arms when engaged and allow for discreet fidgeting.	Discreet pockets allow user to apply compression on arms when engaged.
FLEXIBILITY IN USE	Can be worn multiple ways - second use as scarf.	Can be worn multiple ways - wrapped around, draped over shoulders.
SIMPLE AND INTUITIVE USE	Buttonholes indicate where top of garment is and where it aligns with the vest collar.	I changed the original shawl to make the elbow placement more intuitive for the user. I found from the first user test of the shawl that the elbow darts weren't obvious to the user. So, I incorporated some shaping that indicated to the user that their elbows go there.
LOW PHYSICAL EFFORT	No unnecessary fastenings. A tie for option to wrap around.	No fastenings

Fig. 32 (continued). A/B Testing - Shawl Features, author's work

A/B Testing – Shawl Rating Chart

The chart below (Fig. 33.) displays each user's ratings of both iterations of the shawl - as done with the vest. They rated the main components of the two shawls in order from 1 being most effective to 2 being least. The total of each section determined the effectiveness of the shawls in each category - lower being the most effective. These have been circled.

	Flexibility in Use:	Comfort: Fabric	Calm: Effectiveness of Compression	Intuitive: Donning & Doffing	Low Physical Effort: Fastenings	Discretion:
Shawl #1	212111	222221	222222	122212	222222	211211
Shawl #2	121222	111112	111111	211121	111111	122122

Fig. 33. A/B Testing - Shawl Rating Chart, author's work

Shawl User Feedback:

TACTILE COMFORT	<ul style="list-style-type: none"> Shawl #2 - fabric choice and shaping provides more comfort to the user
CALM AND FOCUS	<ul style="list-style-type: none"> Shawl #2 - Compression is firmer and more effective due to material choice for lining
DISCRETION	<ul style="list-style-type: none"> Shawl #1 - material drapes in a way that allows interaction to be more discreet
FLEXIBILITY IN USE	<ul style="list-style-type: none"> Shawl #1 - Nice to have second use as scarf
SIMPLE AND INTUITIVE USE	<ul style="list-style-type: none"> "How to keep from slipping off the body when not attached to vest collar?" Orientation of the shawl wasn't always clear as the silhouette is less conventional.
LOW PHYSICAL EFFORT	<ul style="list-style-type: none"> Shawl #2 - less effort is required to activate deep touch pressure due to shape and choice of lining

Fig. 34. A/B Testing - Shawl User Feedback, author's work

User Suggestions

- Add sleeves to shawl – could turn into a jacket.
- Change shape to allow for wrap-over action.
- Merge with the belt – belt/wrap/scarf.

Reflections and Responding to Feedback

It was extremely beneficial being able to perform A/B testing at this stage, as it meant that I could identify the pros and cons of each garment which would help identify the most successful features and inform a refined version of each piece.

An important consideration that stood out from this test was the need to improve on the simple and intuitive use of the shawl. The simplified pattern and unconventional

shape of the shawls made the donning and doffing less intuitive. While they both feature buttonholes along the neckline that allow it to attach to the vest, the fact it was fully lined made it heavy and dragged the collar. This led me to look at how the shawl could be more strategic with the lining, having it only cover the areas where compression is most utilised – elbows, shoulders and back.

CHAPTER 6: REFINED DESIGN

6.1 IMPLEMENT: Materialising and Implementing a Refined Design

The feedback from the A/B Testing helped me to identify the strengths of each iteration of the vest and shawl. This took me through the Ideate, Prototype and Test phase again. I made changes to the different versions of the vests and shawls and then made a refined version of each and the complementary belt and hood components. This resulted in a refined shrug (Fig. 35.), vest (Fig. 36.), hood, and belt (Fig. 37.).



Fig. 35. (a) *Shrug elbow compression*, (b) *Shrug back compression*, (c) *Shrug front view, author's work*



(a)



(b)



(c)

Fig. 36. (a) Vest - open side plackets with discreet pocket interaction, (b) Vest collar snaps, (c) Vest side plackets with snaps, author's work



Fig. 37. (a) Vest with detachable compression belt, (b) Hat with ear-flaps, author's work

6.2 “DAY IN THE LIFE” STUDY – USER TEST: VALIDATION

My final round of user testing was in the form of a remote Day in the Life study, a type of Diary study. It was important to test the garments in this way to test the refined designs in the user’s natural environment. This allowed the user testers to interact with the garments in a less intimidating and more natural way. It helped me gain qualitative responses from the use of the garments in context, giving me a better idea of:

- What users’ routines may look like,
- What users do at specific times of the day,
- How the garments may fit into users’ space and daily life,
- How users deal with stress, anxiety, frustration, and discomfort

This helped me further empathise and better understand how the garments would fit into and benefit their daily routines.

Some benefits of a remote Day in the Life study include:

- Less influence or bias from other people.
- More access to intimate moments, e.g. getting ready in the morning, private workspaces
- Can be run without researcher being present
- Gaining qualitative data
- Participants can have agency and privacy over what they are comfortable sharing and can keep non-consenting people anonymous.

6.21 Procedures

The users were given the garments to wear throughout a typical week – wearing it one to two days. Users were invited to fill out a Google form comprising questions: Part 1: Getting to Know the Users, Part 2: Day in the Life, and Part 3: Reflections.

Part 1: Getting to Know the Users

The form opens with questions 1-4, which helped me learn about each person’s challenges and how they manage their sensory challenges.

Part 2: Day in the Life

Questions 5-15 guided them in their interactions and gave them prompts. The user testers were invited to rate the effectiveness of different components and describe their own experiences.

Part 3: Reflections

Questions 16-20 aimed to identify the highlights, lowlights, behaviours and patterns my users noticed during the study. They were given the opportunity to provide feedback and suggestions for improvement of further designs.

6.22 “Day in the Life” – Feedback and Suggestions

	1. What condition do you have? How does this affect your daily life?	2. Which of your senses would you say is most affected?	3. What are the products you use most often in your day, and why? Are any of these used to help manage any sensory challenges?	4. Describe your favourite article of clothing or garment type. What features make it appealing for your comfort?	5. Describe how you were feeling before putting on the garments.
USER 1	I am on the autism spectrum and have Fibromyalgia and Dyspraxia.	Hearing followed by sense of touch	Soft clothes without labels	Warm oversize polyester sweater - comfortable	All fine
USER 2	OCD	Touch	Probably my devices and yes sometimes they help calm me down if overwhelmed, another good one is my earmuffs	I like dresses because they are versatile and freeing	Pretty standard maybe a little stressed with schoolwork
USER 3	Social Anxiety. I tend to avoid environments where I know I'll be around a lot of people	Touch and sound	My Bluetooth earbuds, I've also tried Flare earbuds to help me focus on work and block out distracting noises. Peppermint essential oil and lip balm to mask smells I dislike.	Anything oversized with a bit of weight to it. Clothing that's easy to put on and take off when I get too hot or too cold	Quite stressed and anxious with work, causing my heart to race

Fig. 38. “Day in the Life” - Feedback and Suggestions, author's work

6. Did you notice a change in your mood, behaviour, or mental state after wearing or engaging with the garments?	7. Rate the comfort of the vest from 1 - 7:	8. Rate the comfort of the sleeves from 1 - 7:	9. What areas of the body is the compression most comforting for you?	10. Did you add, remove or adjust any components before putting it on? Did you add, remove or adjust any components while wearing it?	11. How intuitive is the donning and doffing (putting on and taking off) of the vest? Give this a rating from 1 - 7:
Felt very comfortable	7/7	n/a	Shoulders and back	Experimented with belt positioning. Couldn't use the allocated front openings as was covering my bust rather than waist - may be different on a smaller/shorter person. Instead used the belt through the middle of the side plackets - very comfy.	6/7
I did feel a little bit calmer, and I didn't have to take CBD oil	5/7	5/7	The shoulders and the waist	I adjusted the belt a few times and the domes at the side. And sometimes the magnets at the front would come undone	6/7
It was quite calming. After wearing it for some time and removing it, it made me feel lighter and relaxed too	6/7	6/7	My back and shoulders	The belt had to be added before putting it on. I tried tucking the belt ends in vs leaving them out when tying the belt in front - I had to tie it in a double knot to secure the compression	6/7

Fig. 38 (continued). "Day in the Life" - Feedback and Suggestions, author's work

12. How intuitive is the donning and doffing (putting on and taking off) of the sleeves?	13. What features were the most affective in helping you self-regulate? What were they and why?	14. How would you rate the magnetic fastenings on the vest?	15. How would you rate the side snap fastenings on the vest?	16. What activity or time of the day did you find it most affective wearing the garments?
n/a	Magnetic opening as didn't have to think about it	6/7	4/7	Worn going to the vege market
5/7	I think the constant pressure that the tie created was the nicest as it was the most comforting	3/7	3/7	Walking out and about in town and when studying at home
4/7	I liked the pressure provided across the back and shoulders by the sleeves. I also found that the cuffs stopped me from sitting on my hands and helped me to focus on my work	4/7	4/7	Running errands in town and while relaxing at home

Fig. 38 (continued). "Day in the Life" - Feedback and Suggestions, author's work

17. What were some issues or pain points of the garment, and why? What would you do to change that?	18. Do you have any observations about your behaviour when you were wearing the garments? Do any patterns stick out to you?	19. Did you learn or notice anything about yourself through this study? If so, what did you learn?	20. Do you have any suggestions or feedback for the improvement of the garments?
Position of inside pockets were too high for side openings. Top side snaps keep opening and too high up to be easy to do up.	Used top pockets for pressure, not as pockets	Weighted garments are preferred to tight garments	<ul style="list-style-type: none"> -Kept putting hands in the side of the jacket, expecting to find pockets. -Front closure opened when put pressure in lower centre front pockets. +Top pockets used to hold onto and add pressure over shoulders. +Easy to get on and off +Looks great Contrast fabric could be in line with pockets? Collar could be tighter?
The internal pockets that you use to create more pressure on the shoulders was hard to get to because I didn't want to undo the snaps because it was so cold so, and then when I did manage to use them the magnetic fastenings popped open which brought the cold air in. I'm not sure how you would fix this.	Not much behaviour, I noticed that i was less anxious when walking around by myself then I usually am.	Not really	n/a
The top side snap was kind of awkward to do up and popped open when I tried to use the inner pockets. The inner pockets weren't the placed in the most inviting manner, kind of hard to place my hands in at the current angle. The front fastenings popped open every now and then without the belt on too.	I always ended up undoing the side snaps when I went to sit down – also tried to use the front of the vest to add compression on my lap and knees when sitting. The extra weight was nice on my lap. I tried stretching the back of the vest over my lower back to add some compression on it	I find the stretchy materials surprisingly comfy, not a material I'd usually wear	Maybe add stronger magnets at the front Stronger snaps on the sides? Possibly lower the top snap too. Consider different angle for inner pockets to make entry less awkward. Also, the inner pockets were a little small for my hands so maybe bigger ones if possible

Fig. 38 (continued). "Day in the Life" - Feedback and Suggestions, author's work

6.23 “Day in the Life” – Reflections and Responding to Feedback

This last round of user testing brought out some pain points and suggestions for improvement that I don't believe would have been identified in another one-on-one user test. A key pain point identified by the users was the frustration around the fastenings popping open when interacting with the vest's centre front and inner pockets. The fastening identified as a pain point for all users was the opening of the internal pockets in relation to the side openings. In response to this, I changed the inside pockets' opening entrance to be slanted (Fig. 39. (a)). This meant the opening could be more accessible and allow hands to enter in a more ergonomic position - reducing the frustration caused by the snaps opening. The quality of the snaps and magnets I used contributed to this problem. One of the users suggested replacing the top side snaps with large hook and eye fastenings. Two of the three user testers missed the fidget bead maze that featured in the bottom corners of previous iterations of the garment, so I added beads into the hems as a discreet fidget (Fig. 39. (b)).

This resulted in final iterations, as can be seen in Figs. 40, 41, 42 and 43. While the refined garments weren't perfect, different components successfully provided comfort and calm for each user and validated the use of tactile-proprioceptive interventions in a garment, no matter what senses are affected most by the user.



Fig. 39. (a) Slanted Pocket opening with Modular Lining, (b) Fidget Bead in Hem, author's work

Final Vest Features



LINING

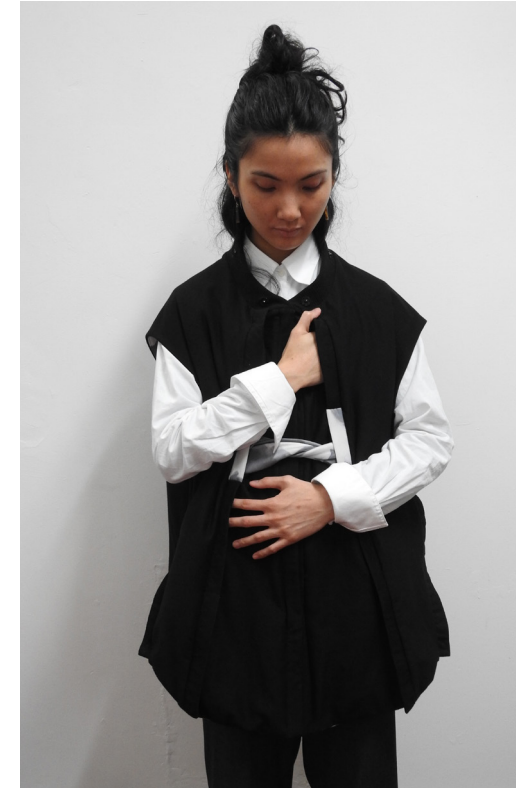
Orientation of lining utilises the downwards stretch when pulled down.

BELT LOOPS & SLITS

Compression belt can be looped through the internal centre back belt loops and out the discreet centre front slits.

POCKETS

Inner pockets attached to lining, facilitate compression. Snaps inside allow user to attach desired modular pocket linings. Deep outer centre front pockets as another option for less intense compression - large enough to fit phone and keys.



CHEST POCKETS

Discreet bamboo lined pockets over the chest serve as a reminder to the user to practise deep breathing/diaphragmatic breathing while hands are interacting with soft pockets. Snaps on inside allow user to utilise the modular pocket linings to suit their own texture preferences.

Fig. 40. *Final Vest Features*, author's work

Final Hood/Hat Features

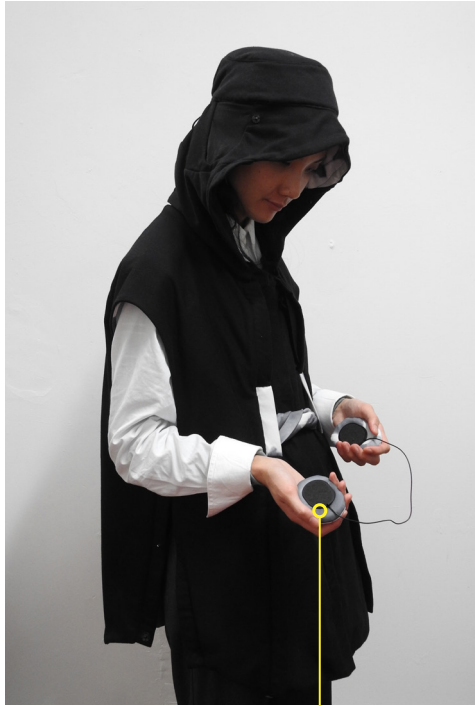
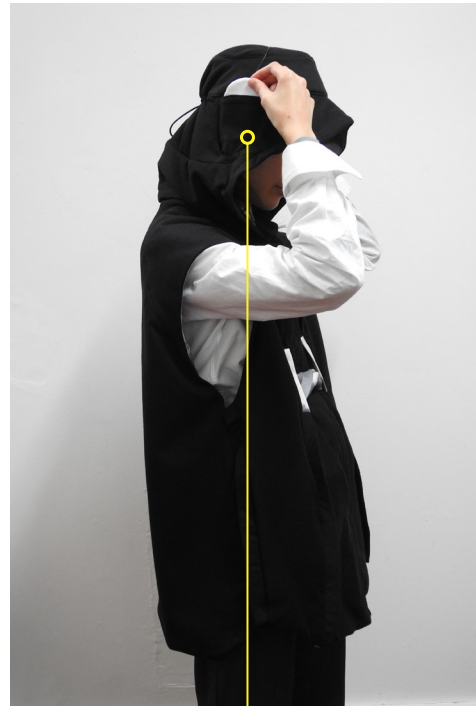


Fig. 41. *Final Hood/Hat Features*, author's work

SOUND REGULATING INSERTS

Removable sound regulating inserts allow user to choose what suits their preference. Allows hood/hat to be washed on its own.



EAR POCKETS

Mesh pockets over ears allow user to add chosen inserts or to wear their own headphones over the hood without interrupting sound quality.



COLLAR SNAPS

Snaps on inside of the hood allow it to attach and detach from the vest when needed.



HAT SNAPS

Snaps strategically placed around the hood to allow the user to fold into a bucket hat.

Final Shrug Features



COMPRESSION CUFFS

Large rib knit cuffs with comfortable finger holes, allow user to maintain compression on wrists and hands while keeping hands free. Compression across back engages when using thumb holes. Thumb holes utilise the two stretch of the scuba knit for more flexibility and comfort around thumbs.

COMPRESSION

Four way stretch Lycra across back, shoulders and elbows - no seams across back. Allows for facilitation of compression in multiple directions when soft bamboo is pulled.

WOVEN BAMBOO

Used for it's breathability and softness. Helps shrug maintain shape, while keeping it lightweight.

POCKETS

Large opening pockets in centre of shrug, allow user to apply compression and control direction and intensity of force with hands.

Fig. 42. *Final Shrug Features*, author's work

Styling Options



Fig. 43. *Styling Options*, author's work

CHAPTER 7: FINAL REFLECTION

This project has taught me a lot about the importance and uniqueness of our senses and how they influence our behaviours and preferences. It has given me a deeper appreciation of Sensory Processing Disorders and the challenges people affected live with and has helped me validate my experiences with my own struggles. Throughout the process, I often felt I was unveiling more questions than gaining answers. This highlighted the difficulty of addressing what is essentially an 'invisible' and poorly understood condition. Studies of SPD in adulthood is a relatively new research area, which is evident in the scarcity of information sources. Regardless, I have successfully compiled seemingly disparate studies – ranging from design to psychology papers, identifying and connecting inter-related ideas and themes, validating them in practice through primary research and working directly with healthcare experts and affected users.

While this posed a significant challenge, I felt an innate duty to help empower those who simply 'put on a brave face' and struggle with these experiences, like me. Not only did I wish to close an observed gap in the market by offering a unique and practical alternative, but I also wanted to close the design gap between these users.

I feel I have provided an opportunity, a voice, to empower those with a condition that is often misunderstood and overlooked. I have managed to bring together the worlds of design and science to benefit adults with no other options to help manage their condition in a non-stigmatised way.

It was a pleasure to work closely alongside my user group – it enabled me to go beyond theory and address issues tangibly. People were quite open and happy to share their experiences with me. As a result of the questionnaires, people were able to learn more about themselves and their conditions, which was extremely rewarding. Many extended their thanks and appreciation for taking the time to research SPD and its impact on adults. Users' open honesty and willingness to participate allowed me to balance functional, expressive, and aesthetic needs. The result was a user-centric, universally designed, modular garment that addresses users' tactile comfort and generates calm and focus while remaining simple and intuitive, requiring low physical effort, whilst providing discretion to the users' condition.

There is more that I would like to refine and test out before I consider commercialising the garments. In future iterations, I would like to expand the range to include bottoms, seasonal variants, and waterproof capabilities. I wish to conduct more long-term user testing to assess and understand the garment's effectiveness over time, fully address garment care and maintenance, incorporate more sustainable materials for the compression, and incorporate the 'Sunflower' motif to help bring awareness to invisible conditions.

I hope that my thesis serves as an example and steppingstone for designers to remind us to seek inspiration and feedback from users to gain insight outside our own experiences – to remind us of the importance of user-centric design, to constantly empathise with users to ensure that what we create serves the users to best of our, and our products' abilities.

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APPENDICES

APPENDIX A:

Defining Terms

ADHD – Attention Deficit Hyperactivity Disorder

ASD – Autism Spectrum Disorder

BFRB – Body Focused Repetitive Behaviours

DTP – Deep Touch Pressure

GAD – Generalised Anxiety Disorder

Hypersensitivity – over sensitivity to sensory input

Hyposensitivity – under sensitivity to sensory input

Neurotypical – thinking, behaving, and perceiving the world in a way that is considered 'typical' or 'normal.'

Neurodivergent – mental and neurological functioning that is considered atypical

OCD – Obsessive-Compulsive Disorder

Registration – The degree to which a person misses sensory input

SBMD – Sensory Based Motor Disorder

SC – Sensory Craving

SDD – Sensory Discrimination Disorder

SMD – Sensory Modulation Disorder

SOR – Sensory Over Responsiveness

SPD – Sensory Processing Disorder

SUR – Sensory Under Responsiveness

APPENDIX B:

Questionnaire #1 Questions

1. How old are you?
2. What gender do you identify with?
3. What is your current occupation?
4. When did you find out you had sensory processing difficulties? Do you have a diagnosis?
5. Do you have any other conditions along with SPD? (e.g., OCD, ADHD/ADD, Autism Spectrum Disorder)
6. Have you had experience with any sensory-based therapy? And if so, how did you find it?
7. Which of your senses does your SPD affect the most?
8. Do you practise mindfulness in any form? Has it been effective for you?
9. How do you deal with sensory overload or stressful environments?
10. Do you currently use any sensory products to help manage your condition? (e.g., weighted products/fidget toys, earbuds etc.) What are your favourites and why?
11. Describe your favourite item of clothing. What features of the garment make it appealing for your comfort? e.g., shape and fit, material and feel, how you wear it; other features, such as: fastenings, neckline/collar/hood, sleeve type.
12. Do you have a favourite accessory e.g., watch, ring, necklace, bracelet? Does it have any features that help you self-regulate? If so, what are they?
13. Are your fine motor skills affected by your SPD? Do you struggle with any particular fastenings on clothing?

Questionnaire #2 Questions

1. How old are you?
2. What gender do you identify with?
3. What country do you live in? Can you get an SPD diagnosis where you live/is SPD recognised as a stand-alone condition?
4. What is your current occupation? Does it require you to dress a certain way/are there any restrictions around what you are allowed to wear?
5. Can you describe a situation where clothing has helped you cope with a stressful situation? Where did this take place?
6. Imagine a garment/item of clothing you find comfortable. Rate these features in terms of importance to you:
7. What fabric type do you tend to avoid?
8. Do you notice any particular positions, body movements etc. that you make when you are in a stressful/overwhelming environment? (e.g. arm crossing, scratching, hair twirling, compression over hands)
9. What specific areas on the body do clothing seams irritate you the most?
10. Do you/have you used any mindfulness apps? What has been helpful about them/what would you change about them?
11. Are there fidget items that you consistently use or do you tend to rotate them? What features does your ideal fidget have? (e.g. type of movement, material, size, sound etc.)
12. Are you familiar with the proprioceptive, vestibular and interoceptive senses? Do you use any products to help regulate these senses

APPENDIX C:

Responses to Questionnaire #1, Q11

“Describe your favourite item of clothing. What features of the garment make it appealing for your comfort?”

1. An old t-shirt I sleep in, it is soft but not clingy, It is slightly larger and not tight, it doesn't require pants since it's a bit larger
2. I have a go to set of pajamas that have no triggering sensory stimuli.
3. Fav Shirt
No fastenings, soft fabric with enough weight to hold its vague shape but still able to move with me. No seams and thin collar, loose fit but not so loose that it moves around on my body (the collar loose so its not pulling, but not so loose it slips off my shoulders) wear it for days in a row when I can, very loose on my waist/hips. Basic solid colours, navy white and golden/mustard. Bright colours are often very off putting visually so I like the simplicity of it.
4. Loose comfy, worn in tshirts
5. Only like wearing my boxer shorts, T-shirt, only wear loose fitting clothes when going out
6. Slip in shoes like all birds. Cardigans - warmth without confinement.
7. I do not actually have a current favorite, but I do have this really soft loose shirt that I love. I struggle with regular t-shirts because it's a rough material that doesn't fit my dog well (rubs and pulls and then is loose in weird spots). And I don't like having something cut in the middle of my arm like t-shirts usually do, but I don't like super long sleeves that out texture at my wrists because I really struggle with that type of sensory input. So I like something that is more of a blouse or loose soft shirt. It either needs to fit tight or fit loose and not press on the arms is the most important!
8. Activewear! I like clothing that easily moves with me and is soft. When I'm physically comfortable, it is one less things for my brain to worry about!
9. Short sleeve t shirt, polyester/cotton mix because it is super soft, printed tag, minimal seams, no big design.
10. Nothing stacky, underwear without the little cotton insert that isn't sewn down, tight but flexible fabric (think really soft leggings-not fleece but athletic soft)
11. I like my red hoodie. Its a size XL (im size Medium) and it's baggy. I like the strings on the hoodie and find it comfortable to twirl them. I also like that the material is softer on the insides and its also soft inside the pockets.
12. I brought fancy stretchy baggy jeans and it feels no restrictive in anyway and I'm a fancy lady. They could fit 11 people in
13. Sweatpants because they're loose and don't hug too tight. It's just tight enough around the waist to not bother me.
14. My organic white and grey striped cotton pajamas from Hanna Anderson because they are real soft and nice and warm but not too warm. The tag is soft and subtle. The color is soft and mellow.
15. It's a mustard yellow sweater, knit. It's soft and has a V neck with "bishop sleeves", which is my favorite thing feeling wise about it- they're oversized down to the wrist and then they're tighter there. Typically wear this to be comfy but look nice with jeans and fall boots.
16. I have a soft, pullover sweater that's made from a really cozy, plush yarn. The sweater is loose-fitting with a wide neckline and loose, long sleeves.
17. my bathrobes. They are slightly fitted but slightly stretchy. Thin belt that stays in place. Makes me feel comforted and just warm enough. I feel naked without one. Not too tight in the arms. Longer sleeves (do not like sleeves that stop at the wrist). Soft but cotton so breathable. No hoods.
18. None
19. Soft pj bottoms. I like the soft.
20. Sleeveless dresses with a built in bra, super soft fabric
21. Cotton shorts. Easy to pull on/off. Don't have any bumps or discomfort if I lie down in them. Don't get overheated, but covered enough to be comfortably modest around the house.
22. Hoodies. Sweatpants.
23. Dresses are the fav. I can't deal with things that are tight or things around my neck
24. Tight, completely covered, no jewelry, hat tied back
25. A very soft hoodie/jacket, low neckline, can close it with a soft belt in the same fabric. No tag no zip no buttons, just softness
26. Fleece lined clothing and sports bras. I like things to feel compressed and soft. I don't like flowy material or when buttons are open
27. Leggings and jumper- soft, none restrictive. Curved loose neck
28. Sweatpants/shorts and hoodies/t-shirts. Loose fitting and soft materials. Anything tight or scratchy makes me itch and eventually causes hives and nausea. I don't like anything tight on my neck, midsection or thighs. Hoodies make me feel safe, like a hug.
29. Loose fitting tank tops/tees, and jeggings are my favorite. Cant stand anything tight or up on my neck. No seams or tags.
30. Cotton hoodie it is soft and easy to get on and off not to tight not to loose doesn't rub or chaff doesn't much around all the time but doesn't try to glue to you do feels breathable
31. n/a
32. Cashmere
33. My favourite item of clothing would be t-shirts. Baggy, soft cotton, no V-necks only circle necks and not a drop seam, just regular Sean's on the sleeves. I wear them with my leggings in the winter (that aren't tight), and my shorts in the Summer.
34. My favorite is a soft old tshirt. It has a low collar and and loose sleeves.
35. Mostly cotton, breathable to prevent overheating, loose, soft, thin material, soft leggings like LuLaRoe, I wear a lot of sleeveless or tank top shirts, Torrid has some amazing soft feel clothing
36. n/a
37. I think my favorite item of clothing is a really soft enormous shirt that's

- too big to hug my armpits and that I can pull my arms inside if I want to
38. Soft, stretchy, smooth, and NO SEAMS AGAINST MY SKIN!
 39. At home, tag-free, v-neck, cotton tee (short sleeve, not fitted, worn a little loose) and tag-free yoga pants (fitted, but not snug), zip-up hoodie if it's cooler (normally worn with the hood down, unless I get really cold, feel sick, or decide to take a nap), cotton socks, mule sneakers or slippers. When going out, a v-neck tee (maybe slightly fitted, but normally "boyfriend" fit), bootcut midrise jeans or nicer yoga pants with pockets, socks, and normal sneakers (not mule).
 40. Shoes with no laces, cotton loose fitting tank top
 41. No jeans, ankle(not low cut) arch support socks,
 42. Cannot have a neckline must be a tank top, no hoodies, I can't wear a bra at all without a sensory attack
 43. Material and feel. Loose necks
 44. I don't have a favorite item at the moment. I tend to like clothes with a neckline I don't have to worry about (not too low, but not tight so I don't feel like I'm choking). I hate tags and seams. I love soft fabrics
 45. Shirts: loose so nothing squeezing me and don't have to wear bra, sleeveless or short sleeve, lightweight
Bottoms: stretchy leggings or stretchy bike shorts depending on weather. I'm very sensitive to temperature.
 46. Old-style boiled wool dresses over a thin cotton tunic (love the heaviness and warmth) are my absolute favourite. Otherwise seamless yoga pants (freedom of movement and feeling nicely enclosed), I hate anything trousers or jeans except those. Socks need to be loose or I can't "breathe". Bra can only be without fastening, brassière-like with a little padding so my nipples are protected. I hate underwear, haven't found any that doesn't make me cringe, so I wear just any. 3/4 sleeves are wonderful, I dislike short sleeves or long ones. Any plastic-containing fabric makes me grind my teeth, I prefer rough fabrics.
 47. Very soft sweater, it's thin and almost weightless. Loose feeling but still looks somewhat fitted, stretchy. (I also really like a very fitted top the gas a lot of give to I feel secure but not constrained) Low neck but not too wide. A pocket and hood. No fasteners (it had a drawstring but I cut it out)
 48. A pair of maternity pajamas, they stretch and cling at the same time whilst not being too tight or getting into crevases
 49. I love long soft stretchy pants and long sleeve shirts with scoop neck or v-neck. Long, Soft, open sweater with pockets and no buttons.
 50. Cotton/ Lycra cotton. I prefer dresses that aren't formal and are fitted. Just plain cotton dress with king sleeves
 51. Pretty much athletic clothing. I usually wear compression leggings and a tunic top with shoes that slide on and off. Nothing extremely tight and itchy.
 52. I don't think I could pinpoint a favorite item of clothing. In certain areas, like my waist, it is important to have pressure. In other areas, like arms or ankles, pressure is a no go. Tags in clothes and seams in socks are maddening.
 53. Shirts, no too tight, no tags and comfortable
 54. Cotton spandex sweat pants, yoga pants & t-shirt or sweatshirt. It has to be soft, light weight, bigger then needed. Not too much elastic or too tight. Prefer no zippers, buttons, snaps, collars, cuffs or strings. Hood has to be on smaller, lighter side. Not heavy and bulky.
 55. I like everything but last year when I started to be sick (MS) I couldn't not tolerate jeans or skinny pants, only joggings pants! I was like this for two months and now I am okay.
 56. Soft dungarees, nothing tight near my neck, comfortable is best
 57. soft, loose, no tags, flowy, nothing touching my collar bone or neck, sleeves near elbows but not on, long length, down to my ankles
 58. old, shredded, soft T-shirts
 59. I don't have a particular favorite, but I mostly wear super soft, tagless tshirts and yoga or pajama pants. My clothes need to be big and soft with no weird textures and no tags.
 60. Loose fitting, collarless, sleeveless dress for summertime. Sweatshirt with super soft interior. Loose fitting, drawstring lounge pants.
 61. Loose, very soft clothing.
 62. T shirts and shorts. Baggy and quality material. Stretchy/elastic. T shirts must have the normal round collar. No v-necks. Must have socks/shoes. I dislike the feeling of bare feet.
 63. 100% cotton is best, loose fitting. Absolutely no turtle necks or elastic cuffs.
 64. Vneck t shirt or collared long sleeve shirt (w long enough arms) jeans soft clothing
 65. Chenille robe. 100 percent cotton, and heavy.
 66. A large heavy buy soft sheepskin robe with big pockets, I like tight -form fitting pants that touch my shoes and long sleeved compression t-shirts with a scoop neckline. Crewneck shirts or turtle necks are bad as well as no-show or crew length,. I prefer going barefoot or Chuck Taylor style tennis shoes. Skirts or dresses need to flare out when I spin. Bras are evil and I wear cotton boxer briefs (they don't crawl up)
 67. Soft crew neck without tags
 68. Bathing Suit, least amount of clothing
 69. Soft clothing, tight wraps for my legs
 70. Oversized t-shirt. For some reason, this one shirt is very soft and fits more comfortably than my other shirts. It's a loose fit with short sleeves. It has no tags and there are no itchy seams.
 71. Cotton clothes, no jewelry
 72. V-neck shirts, nothing "tight" around my neck, being barefoot over socks/shoes

73. I only wear loose dresses - Maxi in the winter and just below the knee in the summer. And they have to be rayon - no high neck, no tags. short sleeve or sleeveless.
 74. Straight leg, relaxed fit, tie string waist. Hate belts. Hate bras with underwire. Socks with no seams. Underwear with cloth covered waistband. Anything to stiff or scratchy is a non starter.
 75. A large, soft t-shirt with no tags and a loose neck. It's comfortable and not itchy or scratchy against my skin.
 76. Baggy sweat shirt and pants
 77. Style varies with the season's. But anything I wear must be super soft, light weight, and layerable.
 78. Old beat-up tee shirt
 79. A sleeveless dress with pockets is my absolute fave clothing to wear. I like a soft cotton that is breathable. I have many of these types dresses but not as many pockets as I'd like. It has to have a low neckline as anything on my chest or up by my throat feels like I'm suffocating. There simpler with less fussiness in the details, the better.
 80. Soft, comfy, and loose fitting. Stretchable fabrics. Large armholes, loose necklines, pullover style tops, not button up, no zippers,
 81. Simple cotton sundress. No sleeves, loose fit, no fastenings. Scoop neck.
 82. Covid era. A poly rayon blend ribbed tank top and light cotton drawstring capris. comando
 83. Super soft, not too tight, with pockets, sleeves with a thumb hole.
 84. Loose fitting bottoms. Sleeveless tops during the summer; loose fitting sleeves during winter. NO layers.
 85. My very old, very soft pajamas. Plus my soft T shirts, track pants and hoodies. No zips, no tags, minimal stitching.
 86. I like soft T-shirts and leggings the most. Texture can be an issue for me. Tags are a no-no.
 87. I like clothes that aren't tight around my armpits. My favorite clothing are dresses that are somewhat loose
 88. Rothco bdu pants and shorts. They have a 3,¼ adjustment for the waist and pockets
 89. Spandex leggings/yoga pants. They fit snug, so no loose fabric that could tickle me. Solid, smooth material, so no mesh/air holes.
 90. Anything baggy like hoodies
 91. I am very particular about waistbands, I'm very sensitive to any pressure so if a waistband is too thin on leggings or sweatpants I feel it too acutely, it needs to be thick and stretchy, and soft. Cuffed at the ankle because things flapping to much make me anxious, and loose fit.
- I pretty much hate most clothing fitted for women because I like things a little loose. I like more unisex clothing.
 92. Absolutely nothing synthetic or allergenic, and lacking any rough textures or seams or tags in annoying places. No snug collars. Usually long sleeves for outdoors, no sleeves indoors. Stretchy or loose fitting.
 93. Any item of clothing has to be super soft, I generally cannot wear it with fastenings directly against the skin (except pants), I prefer fully long or short sleeves, 3/4 length drive me CRAZY. I cannot do turtlenecks. I realize this is general, but I can't think of a favorite clothing item!
 94. I don't have clothes issues, but do have sheet issues.
 95. My favorite is a soft sweater. Material and feel are very important. Then fit and comfort in the item in terms of style. I enjoy sweaters so I can rub the soft material discretely and it's always a happy moment when I remember I'm wearing something soft.
 96. Jeans because they make me feel contained.
 97. Tight fitting silk or cotton are my favorite
 98. I really like wearing tunics and leggings. For the tunic, flowing, soft material -- usually cotton, cotton blend, or rayon -- that flares a little bit from the waist down. No tags. Short sleeves on the tunic. I tend to wear layer larger pullovers or cardigans over short sleeves when it gets colder. No fastenings unless a button or fastener for a cardigan.

APPENDIX D:

Responses to Questionnaire #1, Q13

"Are your fine motor skills affected by your SPD? Do you struggle with any particular fastenings on clothing?"

1. Not usually
2. I do struggle with fine motor skills but also have a neurological condition so i dont know which causes it.
3. A bit, theyre a bit more trocky for me than most people but still doable. They feel awful generally though
4. No
5. Buttons
6. Buttons are really hard and tying shoes.
7. I am not sure, most of my fine motor skills I think are alright but I confuse them with gross motor skills. I think I might have dysgraphia but never formally diagnosed. Also Seems, I despise seems, in pants, sleeves they feel terrible on my skin.
8. No
9. Not really
10. No
11. I sometimes get ADHD/OCD tics in my neck and it is especially triggered by certain sounds or feelings of materials
12. Buttons are hard!
13. Sometimes. It varies really.
14. Yes.I struggle with hook and eye fasteners such as on bras.
15. Took longer to tie shoes, sometimes have a hard time with grabbing things (mostly small stuff or if I'm worried if it's sticky/dirty/etc.), writing/pencil grip issues at times esp if the pen drags
16. Yes, I struggle with chopping vegetables and carrying containers with liquid. I do not thing that I struggle with clothing fastenings, but I generally avoid clothing with fastenings, anyway
17. no
18. Large tags and different materials
19. My writing is affected. I don't struggle with fastenings.
20. I don't think so, I also have dyspraxia so it's hard to say
21. No
22. Zippers I hate zippers when they get stuck. I pull to hard and they break
23. No I don't think they are
24. Yes really bad fine motor skills and I shake
25. Some vestibular trouble: hitting doorways and furniture quite often. I have good fine motricity but a real bad sense of pressure and aim
26. No fine motor issues.
27. No
28. No
29. No
30. No
31. I struggle with small buttons, like wrist cuffs on a dress shirt.
32. Yes
33. Yes. I have a hard time with laces so I don't wear runners. Only crocs that are slip ons
34. Not really
35. I haven't noticed anything
36. No
37. My motor skills are okay, I have more overload trouble than motor trouble.
38. nope.
39. no struggles on that front
40. No
41. No
42. No
43. No
44. Not really
45. Often drop things, spill drinks, writing hurts hand but I can type fast
46. No, but I hate fastenings with a vengeance, I prefer wrap/zip//tie.
47. No
48. No
49. Buttons are sometimes a struggle
50. Yes, smaller buttons with a fastener button/ clasp are finicky.
51. Only due to arthritic disease. I used to be really good at suturing and things like this just stink at legible writing.
52. Nothing that affects wearing clothes. It affects more my movement into space (I bump into things accidentally).
53. No
54. No
55. Last year I had difficulties with my motor skills, I couldn't play piano but now it is ok.
56. Slightly but mostly gross motor skills are affected
57. no
58. yes. motor dysgraphia. sometimes.
59. No
60. No
61. No
62. My fine motor skills are normal. Although I don't like the smell of metal zippers etc.
63. No
64. Yes yes
65. No. Bra closures.
66. small buttons are hard, fastening jewelry, putting on eye makeup, bra closures
67. Occasionally shaky (sp?)
68. n/a
69. No
70. No.
71. No
72. No
73. Hard to say since I have arthritis in all my joints
74. My girls struggle and I help them i struggled as a child but had to help myself.
75. Not really
76. Yes,someyimes have issues with fastening clothing
77. No.
78. No
79. I struggle with writing by hand and some other fine motor skills. Mostly related to art but not all nice example, I can tie knots (macrame) and make beautiful pieces. It just depends on the situation at hand.
80. No, that's not a problem for me.
81. No
82. yes buttons snaps collars cuffs
83. No
84. No
85. No
86. I do not.
87. No, I just hate the feeling of some textures
88. Back bra clasps more than 2.
89. No, my fine motor skills are not affected by SPD. I get irritated by drawstrings, especially when the two strings are really uneven!
90. No
91. Nothing comes to mind, but I do tend to prefer easy to put on things like slip on versus a lace up.
92. Yes. I would rather avoid fasteners and use an elastic and maybe drawstring waist. Buttons, zippers, snaps and hooks never sit fully right and annoy me.
93. My fine motor skills are problematic, but I don't think it is due to SPD.
94. I don't have great fine motor skills. Not sure it's connected.
95. No. However, i do have poor body and spatial awareness.
96. no
97. Yes. Velcro
98. Not usually unless I'm really overstimulated, no. I don't struggled with particular fastenings on clothing.

APPENDIX E:

Responses to Questionnaire #1, Q7

"Which of your senses does your SPD affect the most?"

1. Touch
2. Touch.
3. Touch and Hearing equally much
4. Sight, hearing, touch
5. All
6. Sounds and smell
7. All of them, even including verbal information. When I was young sound and texture was the biggest for me. Sound and sight are a big struggle for me now more so. But it can depend on the day things are always different for me.
8. Touch (textures) and smell!
9. Auditory and tactile
10. Tactile
11. Touch
12. Touch and hearing
13. Touch and hearing
14. Proprioception and auditory
15. Auditory
16. Tactile and hearing
17. tactile
18. Hearing noise
19. Hearing
20. Sound
21. Sense of touch
22. Sight, sound.
23. Now that I'm older, all of them.
24. Hearing sight touch and Proprioception
25. Hearing and smell
26. Auditory
27. Foods- Smells & textures
28. Smell, hearing and touch
29. Taste and touch
30. Hearing
31. Smell, and touch
32. Ears, eyes
33. Tactile is # 1, and smell is # 2.
34. Auditory and tactical
35. Hearing, smell, temperature/touch
36. All
37. Touch most of all, but plenty of hearing too
38. oversensitive to light and sound and some clothing texture issues
39. Probably auditory
40. Touch
41. Sound
42. Tactile
43. Touch and sounds
44. Tactile and proprioceptive
45. Hearing and Touch
46. Hearing, scent!, touch/textures
47. Touch and sound
48. Hearing and sight
49. sound and touch
50. Sound/ hearing/ auditory
51. It affects my way of thinking. All senses are affected.
52. Depends on the day. Let's say hearing, touch and taste.
53. Sound, sight (lights,brightness) smell
54. Touch, feel, smell, taste
55. Vestibular, vision and proprioception
56. Vision and hearing
57. proprioceptive, kinesthetic, taste, feeling
58. hearing
59. Vestibular, Touch, Olfactory, & Auditory
60. Auditory, touch/motion
61. Touch and sound
62. Smell and Hearing.
63. Hearing
64. Ears eyes sense of touch
65. Touch sound taste
66. tie between eys and ears
67. Auditory if around high-pitch noise, otherwise light contrast
68. Sound
69. Touch, Hearing
70. Tactile, auditory
71. Hearing and touch
72. Proprioceptive/vestibular
73. vision - lighting
74. Skin is very sensitive. Eyes are sensitive to light. Can only wear certain clothing. Anything too constructive can trigger a meltdown.
75. Hearing/Auditory, smell
76. Hearing
77. Hearing, visual
78. Touch
79. Two pretty significantly that I can't place one over the other. Artificial light feels like it is killing me slowly. Most daily life sounds are painful these days.
80. Smells, loud or annoying sounds
81. Touch
82. touch
83. All
84. Smell
85. Touch and sound
86. Hearing
87. Noise levels really drive me crazy and textures
88. All of them
89. All of them
90. Tactile, auditory visual, taste
91. Hearing, body sensations, sensory overload
92. Varies by day and situation.
93. Auditory
94. Hearing
95. Hearing
96. smell
97. Sound and touch
98. Tactile

APPENDIX F:

Responses to Questionnaire #2, Q9

"What specific areas on the body do clothing seams irritate you the most?"

1. Back of my neck, waist, forearms
2. Toes, back of neck (tags, Velcro)
3. On the face, neck, around waist, under armpits, chest area
4. round my neck, inside of elbows and knees and feet, also groin area.
Basically anywhere material has to crease when I bend.
5. Stomach and ankles
6. Feet!
7. Feet underwear bras and panties, pants, shirt labels.
8. Shoulders, waist, arms, bust.
9. upper back - BRAS
10. Legs and torso
11. Top of arms, belly, thighs, back, groin

APPENDIX G:

Responses to Questionnaire #1, Q13

"Do you have any other conditions along with SPD?"

1. Depression, panic attacks
2. ADD, PTSD, and many physical ones
3. Yes, Anxiety, depression, and some other undiagnosed issues I'm sure
4. PTSD, panic disorder, OCD
5. Autism
6. Adhd
7. Autistic, OCD, tic disorder, migraines, other chronic pain and GI issues
8. Anxiety, depression, borderline personality disorder, OCD
9. Tourette Syndrome, Generalized and Social Anxiety Disorders, Depression and suspected autism
10. Autism
11. I have ADHD and mild OCD
12. Adhd and dyspraxia
13. OCD
14. Anxiety
15. ADHD
16. Suspected ADHD (undiagnosed)
17. Anxiety, depression, bipolar
18. Yes
19. ASD
20. Yes
21. OCD, ADD, Anxiety, Depression
22. I am pretty certain I have adhd.
23. ADHD, Anxiety and OCD Traits
24. Ocd
25. Maybe ASD, not tested
26. ADHD
27. Suspected ADHD
28. ADHD
29. Depression, anxiety
30. No
31. ADHD
32. Anxiety / trauma
33. OCD, ADD, Autism, Tourette's Syndrome and epilepsy
34. Starting the process to get tested for autism
35. Anxiety.... But I believe it's SPD induced
36. OCD
37. Not that I'm aware of, but maybe
38. ADHD
39. ASD, GAD, Social Phobia, Depression, possibly ADHD (formally diagnosed for all except ADHD)
40. PTSD, Anorexia and Bulimia,
41. ADHD, anxiety, depression
42. DID, PTSD
43. OCD, ADHD
44. Possibly ASD, but no other formal diagnosis
45. OCD
46. Not known
47. ADHD
48. ASD and ADHD
49. ADHD, OCD, depression
50. Suspected ADHD
51. ADHD-combo, GAD, depression, psoriatic arthritis, Sjögren's syndrome, and binge eating disorder. Docs say bipolar but it's easy to misdiagnose with all the current diagnoses.
52. No
53. Possibly adhd
54. I have ADHD
55. I had a concussion 8 years ago
56. I'm currently being assessed for asd
57. ADHD, OCD, PTSD
58. autism, ADHD, anxiety, depression, CVID, (primary immunodeficiency)
59. OCD, PTSD, & Panic Disorder
60. Anxiety, ADD
61. No
62. OCD, Anxiety, Depression.
63. PTSD, asthma, proctalgia fujax, fibromyalgia, & epilepsy
64. Yes

65. Not that i know of
66. ASD, C-PTSD, OCD, Major Depressive Disorder, GAD
67. ASD
68. ADHD
69. Epilepsy, TBI
70. ADD, Depression, Anxiety, possible autism spectrum
71. No
72. No
73. OCD
74. Nothing diagnosed except depression, anxiety and fibromyalgia. I likely also am on the ASD spectrum as well as Adhd but no formal diagnosis. It will cost \$700 to have my ADHD diagnosed so I can get medicine to help me.
75. ADHD and Memory Processing Disorder
76. ADHD, Autism,
77. OCD, bi-polar, depression
78. ASD
79. Tourette Syndrome; diagnosed. Autism and ADHD highly suspected but not diagnosed. Put two and two together throughout my forties. I just turned 50.
80. Multiple chemical sensitivity
81. No
82. adhd asd
83. Adhd and likely asd
84. Yes
85. ASD
86. Depression
87. I suspect that I might have ADHD but I have never been diagnosed or treated
88. ADHD
89. ADHD/ADD, anxiety, depression, misophonia, trichotillomania, chronic post-concussion syndrome
90. n/a
91. Depression, anxiety, anorexia, undiagnosed conditions
92. Yes
93. PTSD
94. GAD, low end ADHD
95. ADHD, HSP, anxiety, depression
96. OCD, Suspected to be on spectrum but never diagnosed
97. ADD
98. Depression and anxiety

APPENDIX H:

Responses to Questionnaire #1, Q10

"Do you currently use any sensory products to help manage your condition?"

1. I like squishy balls, these take my focus away from whatever is disregulating me
2. I plan to start using some special earplugs. I wear extremely comfortable clothing. I cannot tolerate weighted products due to a neurological issue.
3. Yes. Weighted products are essential for me,
4. Weighted blanket! My life savor
5. Fidget toys, spinners , Rubix cubes etc
6. Loop earbuds to reduce noise. Essential oils whose smells relax me.
7. Earplugs, noise canceling headphones, fidget toys, soft things to self soothe. This may sound odd, but my dog helps me calm down the most, I find just being next to her to really help me not get overwhelmed and she can sense when I do get to a bad point and will jump to me and help me calm down. Other than that, I would say my headphones help me throughout the day because with covid my whole family is home, so it's a lot of sensory input, so I am able to block out a lot of noise which helps a ton. I also have a rocking chair that really is a great way for me to stim that I absolutely love!
8. I have a 20 lb. weighted blanket. I don't always use it (because it's large) but it is very grounding and feels like a solid, consistent weight all over!
9. Weighted blanket, sensory swing, fidgets and ANC headphones
10. Fidgets help me focus during classes and work meetings, weighted blankets help when I sleep, earbuds help when my boyfriend wants to watch videos but I'm trying to rest
11. No i don't
12. Weighted blanket at night is amazing
13. No
14. Yes. Weighted blanket (proprioceptive input) and ear plug/earmuffs (takes edge off of sound and noise).
15. Ear plugs that reduce sound have been helpful, I think they're called loop. Also like to have a fidget toy to focus on instead of the noise. Usually use my pop socket on my phone or a mobii metal ball.
16. I like my fidget spinner ring, roll-on essential oils, sleep mask, and sleep headband with ear buds. I like these to help regulate me, but I'm still exploring options. I want to get a weighted blanket and noise-cancelling headphones. I've tried a few things that haven't worked: Flare ear buds (fall out of my ear) and the Hug Sleep Pod (I feel too constricted)
17. weighted blanket, noise cancelling headphones, lap pads, fidgets. Noise cancelling headphones are my fav because it resets my mind. I also love squishmallows to squeeze and tangles to fidget with
18. Weighted blankets because they make me feel calm
19. Weighted items (blanket, lap pad, stuffed animal), earplugs, tinted glasses
20. Noise cancelling head phones, a blanket, and a service dog in training
21. Weighted blanket at home. Haven't experimented too much with others.
22. Lavender oil, heavy blankets. Sound machine. Low Fi hip hop music. (Lofi girl on YouTube)
23. Some times fidget toys. I need to look into getting earbuds and glasses for light sensitivity
24. No
25. Earbuds for sleeping, a hanging hamoc, some fidget and lava lamps
26. Not consistently.and not really products. But when I'm experiencing lots of input that I can't filter I reach for a specific playlist and sour gummies
27. Fidget toys, music with EarPods
28. I love weighted blankets, they make me feel like my body doesn't need to move as much and gentle pressure calms me. I also wear earbuds most of the time when I am in public just to cut down on outside noise.
29. Hate weighted blankets. Nothing much has helped. I find quiet, music and fish tanks do help calm me.
30. 1. Noise canceling earbuds (help tone down the world) 2. Fidget toys
31. I use fidgets, I like the ones with water beads in the squishy balls but they're often too easy to break. They're poorly made. I also like the marble in the mesh fidget.
32. No
33. No I don't.
34. Noise cancelling headphones ear plugs, weighted blankets. The headphones and my weighted blanket are my favorite. With the headphones I feel like I can hear normally. The weighted blanket helps calm me down.
35. Ear buds, weighted blanket occasionally
36. n/a
37. Weighted blankets yes, they're the best
38. Musicians earplugs, and noise cancelling headphones, yellow sunglasses for nighttime and cloudy/foggy driving, dark sunglasses for day driving and transitions prescription lenses
39. Headphones, earplugs, earmuffs, weighted blanket, soft/fuzzy blanket, fidget cube, matchbox cars (the ones with the doors and hood that open and wheels that spin - I like to fidget with them, and some of them fit nicely into pants pockets)
40. Weighted blanket with a fabric I can tolerate makes me feel safe. Loops/ Vibes reduce the amount of auditory input I take in making me last longer in stressful environments
41. Earbuds, weighted blanket, tagless clothes, fidgets
42. I cannot find anything that helps
43. Headphones
44. Weighted blanket (I love it!), sometimes earbuds without anything

- playing to decrease environmental noises
45. Noise reducers, other than that I just need sunglasses if I go outside at all (will get migraine if I walk across street to mailbox w/o sunglasses), blankets in my car/husband's car, sweaters in any public indoor space- grocery store, bank, doctor's office, etc
 46. I like earbuds but they make me inattentive to the kids, so no.
 47. Loop ear plugs, weight blanket
 48. Sony noise cancelling ear phones are a life saver when going outside. DPT is wonderful but a blanket does not provide this, it's why I got a massive dog, works much better.
 49. Haven't tried weighted products, don't like some fidget toys. Have been using earbuds a lot, sometimes I don't even realize I keep them in with no music on. When everything sounds muffled its more comfortable.
 50. Earbuds, I listen to my favorite podcast or chewing gum helps me.
 51. Weighted blankets, avoidance if possible, pressure (squeeze hugs or back rub when needed) low lights or not many, low noise levels etc.
 52. Seamless socks, headphones
 53. Music and scrolling online
 54. Weighted blanket, fidgets, headphones. Blanket helps my body aches & helps my body calm down. Fidgets so I don't bite or pick at my nails. Headphones to block out annoying unnecessary sounds.
 55. Weight blanket to sleep but I want to explore other things in the day to calm down
 56. Jewellery I can play with, aromatherapy oils on bracelets etc.. for grounding
 57. fidgets, weighted blanket,
 58. ear plugs, headphones, blindfold, nose plugs
 59. Active noise canceling headphones & kinetic sand. I like them both for unknown reasons
 60. I have a weighted blanket, but for a few reasons (hot flashes, back issues) I rarely use it. It definitely works when I do use it.
 61. Earplugs and eye ask to sleep. Carry lotion in case I have to touch dry substances.
 62. Earbuds or headphones. Lavender oil and Peppermint oil.
 63. Construction ear muffs, sunglasses
 64. Blankets w the the stripe stitched on I put it between my fingers
 65. No
 66. Over the ear head phones, weighted blanket, pocket size squishy toys
 67. Earplugs/muffs, thunderstorm MP3
 68. Loops Ear plugs
 69. Weighted blanket, heated blanket, ear buds, sleep in a beanbag
 70. No.
 71. No
 72. No
 73. occasionally - bubble wrap
 74. Earbuds help. Weighted blankets help. Soft fabrics.
 75. No
 76. I use fidget toys, weighted blanket, Special Head Phones
 77. Ear plugs. Only thing that completely blocks the offending noise, like barking dogs, gum popping, etc.
 78. Weighted blanket, fidget toy
 79. I use weighted props of all sorts. Many I use in my yoga practice. However, I also have several homemade props that I use in my sleep along with a ton of pillows. Ive recently come to realize that my need to always use a straw is related to my sensory issues. The straw has to be just the right kind though. The wrong texture can ruin things completely.
 80. Earbuds help me tune out loud or annoying noises
 81. Textured fabrics help the most
 82. weighted blanket memory foam pillows
 83. Soft blankets and a tongue ring.
 84. I use active noise canceling earbuds when I go to noisy places. I currently work at home and LOVE it b/c I can control the sensory stuff to my liking.
 85. None
 86. Earplugs are my best friend.
 87. I use earbuds... weighted blanket and I do jiu jitsu with provides deep pressure.
 88. Weighted stuffies, weighted pillow for legs, ear plugs, sun glasses, music through headphones, avoiding the trigger, crafts that keep my hands busy
 89. Fidgets--hairbands, firm stress balls, therapy putty, model magic, Rubik's cube
 90. Fidgets, weighted blanket, headphones
 91. Weighted blanket but need a new one, headphones, putty, fidget toys
 92. Extremely soft ear plugs are my most common useful tool, but I use various different things. I've tried pilot headphones and loved them, but expensive. Weighted blankets are too hard to clean. Everything is a fidget toy to me.
 93. I discovered bone conduction headphones this summer and they changed my life. I love that I can wear them during the workday and still hear what is going on near me, but have my music playing so that it distracts me.
 94. Occasionally the loop earbuds.
 95. Flare Audio Calmer Pros: I recently began and enjoy them thus far, but still observing impact overall.
 96. Weighted blanket. Helps me calm down at night.
 97. Earbuds! I can't stand hearing whistling but it's pretty inevitable so earbuds help so much
 98. Weighted lap pads and blanket; weighted wristlets. Earplugs, nose-blocking headphones. My weighted lap pad in my car is probably my favorite -- it helps keep me regulated while driving and in between activities