



Fellow Report 2024 - Creative Impact in Practice

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Trousers to Climb Trees:
An Experiment in Inclusive Clothing
Design Practices to Support
Neurodivergent Sensory Needs

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1. Summary

This pilot project is a clothing design investigation shaped by the lived sensory experiences of neurodivergent wearers. *Trousers to Climb Trees* is a case study that emerged from my praxis-driven PhD research, at NTNU in Norway, that investigated neurodivergent sensory needs in clothing. The academically situated research found that the sensory discords crafted within clothing construction and the constricting fit of clothing can have a profound impact on the health and quality of life of the wearer. At best, it distracts the mind from the task at hand. At worst, the body perceives that it is under attack which puts it in a state of chronic stress.

Through the generous support of the CIRCE fellowship, I experimented with an alternative fashion practice that explores how we might more consciously design clothing when we have awareness of the impact of sensory distress on the neurodivergent community. The project was also an exercise in inclusion; cultivating a collaborative dialogue between the moving bodies and lived sensory experiences of my neurodivergent research participants. My way of working recognises that whilst we all have different physical needs, everyone desires access to the same universal emotional experiences. Clothing is a form of self-expression; it signals where we *fit* and where we do not. By focusing on the case study of denim trousers (jeans) we see that

emotional and relational needs are often in tension with a person's physical sensory needs. The goal is to find a sensory equilibrium.

The title of this pilot project was inspired by one particular research participant's response when asked how she wanted her office trousers to feel, "I want to feel like I can climb a tree!" This shifted the focus from eliminating sensory distress to optimising sensory nourishment. It also positioned the moving body at the forefront of the design process. Therefore, our first step in the design experiment was to go out and climb a tree to understand the movements that the trousers should facilitate and how the fabric should respond to these movements. By prioritising the kinaesthetic sense, the aim was to explore how clothing can support a feeling of freedom; physically, emotionally, and relationally. Through a series of iterative embodied workshops I collaborated with a neurodivergent research participant and a choreographer to transform a traditionally static and visual design practice into one that is dynamic and multi-sensory.

This is the first step in pursuit of the optimal design and production processes for *Trousers to Climb Trees*. Through the pilot project I have built a body of work which I have used to communicate neurodivergent clothing needs to design and manufacturing partners. This has allowed me to build strategic working relationships to sustain this project development into its next phase.

2. Problem & Evidence

In this section I present evidence of how clothing sensations contribute to sensory distress and overwhelm for neurodivergent individuals, and how this impacts their health and quality of life. I explain why neurodivergent sensory perceptions are not the problem. Instead, I identify the problem as the design and manufacturing processes that craft sensations. More specifically, there is a lack of consideration of sensory experiences, and an absence of diverse minds and bodies, in these processes.

2.1. Reciprocal sensory dialogues with clothing & the body

Clothes are the most intimate artefacts that touch our skin. They mediate almost all of our daily interactions. Every day our moving bodies are shaping and being shaped by what we wear through a dynamic reciprocal dialogue. Our bodies and clothing are in a constant reciprocal dialogue that is tactile, sonic, and kinaesthetic. The sensations that unfold during this dialogue shape how we feel, physically, emotionally, and socially. These are universal experiences for all of us but for those of us who are neurodivergent they can be experienced more intensely.

2.2. Neurodivergent sensory experiences: a medical perspective

The human race is neurodiverse, meaning that we all shape and are shaped by our sensory environments in many different ways. The human race thrives on this diversity. Each of us are constantly searching for our own unique sensory equilibrium that enables us to make our contribution to the world. However, for some the quest for sensory equilibrium can be more challenging. Numerous medical studies show that 90% of neurodivergent people (e.g. autism spectrum, ADHD, OCD, dyspraxia) report sensory distress on a daily basis (Robertson & Simmons, 2012, 2016). That is to say that they experience sensations in their environments at amplified, and often unbearable levels. At best sensory discords distract the mind from the task at hand and at worst the body feels under attack. Fight, flight or freeze responses to these sensory attacks can play havoc with a person's nervous system and result in their body being stuck in a state of chronic stress. This has a profound impact on their health and quality of life. It can affect a person's ability to do the things they want to do that contribute meaningfully to society (e.g. work, studies, and relationships). Common examples of potentially distressing sensory inputs from our environment are bright lights, strong smells, and loud sounds. As a fashion designer I was concerned with the sensations in our most immediate environment: our clothing.

2.3. Neurodivergent sensory experiences with clothing: perspectives from online autistic forums

Digital searches of online forums within English speaking autistic communities revealed that clothing is one of the main contributors to sensory distress. A very quick analysis of online threads indicated that sensory issues with clothing are prolific among young children on the autism spectrum and that these issues do not ease in adulthood. Parents observe their young children's fussiness, irritation, frustration and anxiety with problematic clothing sensations. However, the adult descriptions of these experiences reveal the true extent of the physical, emotional and social effects of processing these sensations. They describe physical pain, dampening of cognition and disablement of everyday interactions such as getting a job and then performing effectively in that job. Their mental well-being is affected by the clothing but the fragility of their mental state also affects how sensitive they are to the clothing, creating a cycle of stress.

2.4. Dominant fashion design practices: a lack of sensory consideration

Despite evidence that clothing sensations cause sensory distress for people who are neurodivergent, there is a distinct lack of vocabulary and understanding of the materiality that contributes to these sensory experiences. For the last four

years, through a PhD research project, I co-created knowledge with over 70 neurodivergent individuals about their sensory experiences with clothing. The aim was to elucidate this materiality. Together we identified the decline in clothing quality, as a result of fast-fashion, as the main sensory triggers: the tactility, sound and smell of synthetic petroleum-based fibres, roughly overlocked seams that dig into the body, and scratchy labelling. In addition, the increasingly poor fit of clothing causes the body's movements to be restricted, creating a feeling of entrapment, claustrophobia, an encroachment on the internal by the external environment. It is clear that the design and manufacturing processes that dominate modern clothing production are at odds with the sensory needs of neurodivergent customers, and arguably the wider population.

As designers we are always crafting sensations, whether we are conscious of it or not. However, existing design practices do not always allow space for the conscious consideration of their impact. If we take the reciprocal sensory dialogue that I described in section 2.1, it is obvious that one should place the moving body at the forefront of a clothing design process. This might not seem like a radical shift, after all, clothes mediate our dynamic everyday life. To be dressed in clothes is an embodied practice. However, the modern conception of clothing is predominantly a flat sketch, a 2D computer model, a static fitting on a

mannequin; “the body is often used as a blank slate onto which visual concepts, idealisations of identity and conditioned forms of aesthetics are projected” (Bruggeman, 2018 p.30). Furthermore, the production happens in another continent. The procurement of garments in more efficient ways (i.e. lower costs) happens at the expense of material and construction quality. The designer rarely crafts this production: “the system reduces designers to suppliers of raw material. They provide the random ingredient for the preparation of fast-fashion snacks.”¹ The communication between designer and manufacturer engages a visual language that cannot capture the complexity of felt experiences. Post-production, the success of clothing design is measured by sales figures at the point of purchase. The life of the garment after that point, how it works or doesn’t work in a person’s everyday life, is rarely examined (Fletcher & Klepp, 2017).

Through the academic setting of the PhD project I was extremely privileged to access people’s thoughts, feelings, lives and experiences that are not typically accessible by designers. The CIRCE fellowship has expanded this privilege further by affording me the opportunity to invite several research participants into my design practice, positioning their moving body and sensory experiences at the forefront of the design process. As a design researcher, I am interested in

understanding the clothing needs of neurodivergent communities. As a fashion designer, I am motivated to provide meaningful and sustainable solutions that are accessible to neurodivergent communities. To do so, it is necessary to examine the design and production limitations of current fashion design practices and explore alternative opportunities.

This pilot project therefore sought to answer the question, or at least begin to explore, how can we design clothing differently when we have awareness of the impact of sensations on the lives of neurodivergent individuals?

2.5. Dominant fashion design practices: exclusivity as the antithesis of inclusion

I have established that neurodivergent sensory needs are underserved by the fashion industry. From a creative entrepreneurial perspective, this means that there is a significant untapped market devoid of any meaningful competition or alternative solutions. From a social impact perspective, this reinforces a collective neurodivergent feeling of exclusion from the fashion system and society at large. One of my neurodivergent research participants described a recent shopping trip where he had to turn everything inside out to detect the potential sensory discords and still did not find anything suitable that he could purchase:

“I have no interest in being normal, but I want what is normal to me to be accepted. I had zero options on the shelf. Fashion claims to be all about self-expression but you can only express yourself as long as you fit into their determined box and get over your sensory issues.”
(Dave, 37)

The fashion industry influences culture. It determines which bodies and minds are valuable. Historically fashion has been a vehicle by which many bodies and minds have been excluded. It is clear that both bodies and materials in fashion need more care and attention (Bruggeman, 2018). However, I believe that the same power that has been exploited to cultivate exclusion has the potential to foster a culture of inclusion in which all minds and bodies are valued, and the affective consequences of their material interactions are better considered. This is the mindset with which I embarked on my journey through the CIRCE pilot project.

3. Journey

This section documents the journey from the project’s inception and through the evolution of iterative prototypes that are vessels for the knowledge gathered in this pilot project. Visually it documents how the project was structured into a series of embodied workshops that integrates the moving bodies of two neurodivergent participants, Stine and Erik, and a choreographer, Rannei.

3.1. The emergent case study for Trousers to Climb Trees

The departure point of the PhD research was a synthesis of the neurodivergent clothing needs gathered through a series of wardrobe studies (semi-structured interviews in the presence of research participants’ existing clothing). These needs were organised into three categories: physical, emotional, and relational sensory needs. However, as will become apparent in this section, physical, emotional, and relational sensory needs are inextricably linked. At times the pursuit of one need compromises the others. Often they appear to be in direct opposition. Yet, what we remain in pursuit of is a sensory equilibrium. Denim trousers emerged as the perfect case study to explore how a design process can facilitate this pursuit. The argument for this case study is explained through one particular research participant Stine. She emerges as the protagonist of this project, firstly because we worked so closely together, but also because the articulation of her lived sensory experiences resonated so strongly with the other neurodivergent participants.

3.1.1. The case for denim trousers

Almost every neurodivergent research participant, with which I collaborated with in the wardrobe studies, has a complex obsession with jeans. There are just too many sensory discords and restrictive

1 Bruggeman quoting the manifesto ‘Hacking the System’ by Alexander van Slobber and Francisco van Benthum

material qualities that are inherent to this garment, that cause sensory overwhelm. Yet this physical discomfort is juxtaposed with a deep desire to fit in with social norms. Often, the participants lamented the torture of jeans whilst sitting there wearing them. They choose to put them on that morning. The emotional and relational desire to “fit-in” with colleagues, friends, and classmates often happens at the expense of physically feeling at ease in their own bodies. It is a tension that pulls back and forth; a tension I am fascinated by.

For almost all female participants, their abdomen region was highlighted as a particularly problematic area, vulnerable to sensory attack. Stine described how pressure on her abdomen, particularly when sitting for extended periods of time, can disable her interactions physically, cognitively and socially:

*“It feels like a stranger slowly sliding their hands around my waist.
They approach from behind.
I can’t really process the feeling.
I feel violated.
I am physically restricted.
I don’t know how to escape,
so I freeze.”*

(Stine, 26)

Through my fashion design practice I was motivated to eliminate this abhorrent sensation from the everyday life of the neurodivergent community in general, but particularly for females. I was determined to eliminate the physical materiality that contributed to this

felt experience, without sacrificing the emotional and relational needs that were established earlier.

3.1.2. The case for tough trousers

Many neurodivergent research participants used clothing as an armour to protect from unwelcome sensory inputs from the wider environment. It is also an armour worn to signal where they desire to fit-in. The neurodivergent research participants did not desire expansive sweatpants to alleviate these physical sensory discords. This would upset the relational and emotional equilibrium. One described how wearing sweatpants would feel exposing, “like I got caught in my pyjamas”. Many iterated the word “tough” as a celebrated material property. My interpretation was that they saw their clothes as a barrier between them and their surrounding environment. I felt it also implied a character attribute that they thought important to project; toughness as an antithesis to the perceived weakness of their diagnosis.

3.1.3. The case for trousers to climb trees

When asked how she wanted her clothes to feel, Stine responded with
“I want to feel like I can climb a tree!”

I was confused. I explained that the context of use would be in the workplace. She said,

*“You didn’t ask me what I wanted to do in them.
You asked me how I wanted to feel in them.
I’m not necessarily going to climb a tree,
but I’d like to feel that it’s a possibility.”*

Over several subsequent meetings, we unpacked Stine’s tree climbing statement together. We concluded that she was expressing an aspirational emotional feeling she wanted her clothes to provide: freedom. Explicitly it was about freedom of movement. Implicitly it was about moving through her day freely: free from sensory discords, free from distractions, free from restrictions, free from judgement. Physical freedom facilitates emotional freedom and relational freedom. She elaborated that tree climbing movements make her “feel like myself. I can’t climb trees in a dress. It gets in the way”. She vividly

recounted how as a child she was forced to wear an “icky synthetic velour” dress to a birthday party. She tried to escape from the party’s sensory overload. However, the skirt hindered her run, catching on a fence as she tried to climb over it. It is this entrapment, both sensorially and physically, that Stine has been running from ever since.

3.2. Embodied workshops

The entry point of this pilot project was to absorb and translate the phenomenological and participatory synthesis of neurodivergent clothing needs, described in the previous section, into a design practice. Visually I now document how the project was structured into a series of embodied workshops that integrates the moving bodies of two neurodivergent participants, Stine and Erik, and a choreographer, Rannei.



Figure 1. Demonstrating Stine’s (dis)comfort with jeans

3.2.1. Workshops 1&2: tree climbing exercises

To begin our exploratory design process, Stine and I went out and climbed trees. The objective was to understand the range of motion that Stine needed to feel free from the sensory triggers and indulge in the nourishing sensory inputs that tree climbing offers. I repeated this exercise with another research participant, Erik, that had recognised himself in Stine's descriptions, see figure 2.

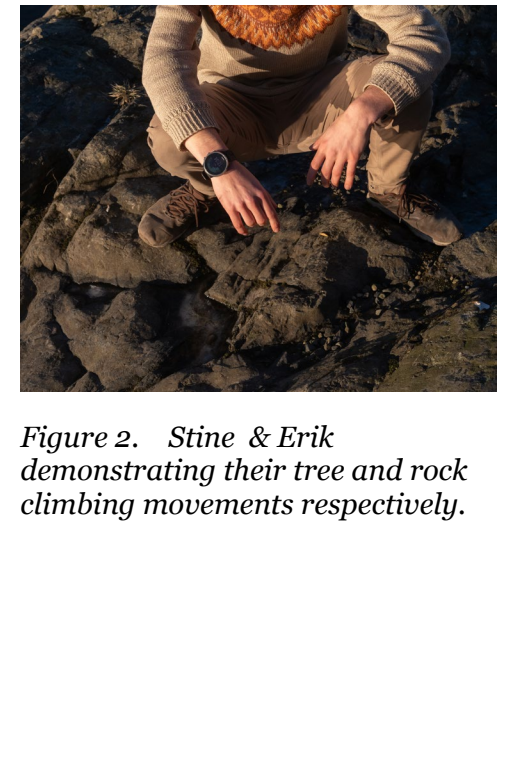


Figure 2. Stine & Erik demonstrating their tree and rock climbing movements respectively.

3.2.2. Workshops 3&4: climbing movement protocol

With this dynamic real life tree climbing exercise we explored how clothing choreographs the movement of the wearer. We developed a test protocol for the movements that the trouser design should facilitate by mapping the most common positions that the two participants found themselves getting into and out of most frequently. In a follow-up session we also marked the direction in which the fabric must stretch when getting into and out of these positions, see figure 4.

Figure 3. Experimenting with the directionality of the fabric and how it responds to the moving body



3.2.3. Workshop 4: directionality of a tough natural fabric

I sourced a “tough” denim fabric. It is 100% cotton, complying with the preferred natural fibres. Typically a denim fabric is woven with a warp and weft, i.e. horizontal and vertical lines. This means that material is strongest and stiffest along these directions. It is a typical characteristic that a woven fabric has the most stretch along the bias, i.e. the diagonal lines running 45° to the warp and weft. Furthermore the fabric that I sourced was woven with a twill pattern. Without getting too technical in this report, this type of weave enhances the stretch across the bias, as demonstrated in figure 3.

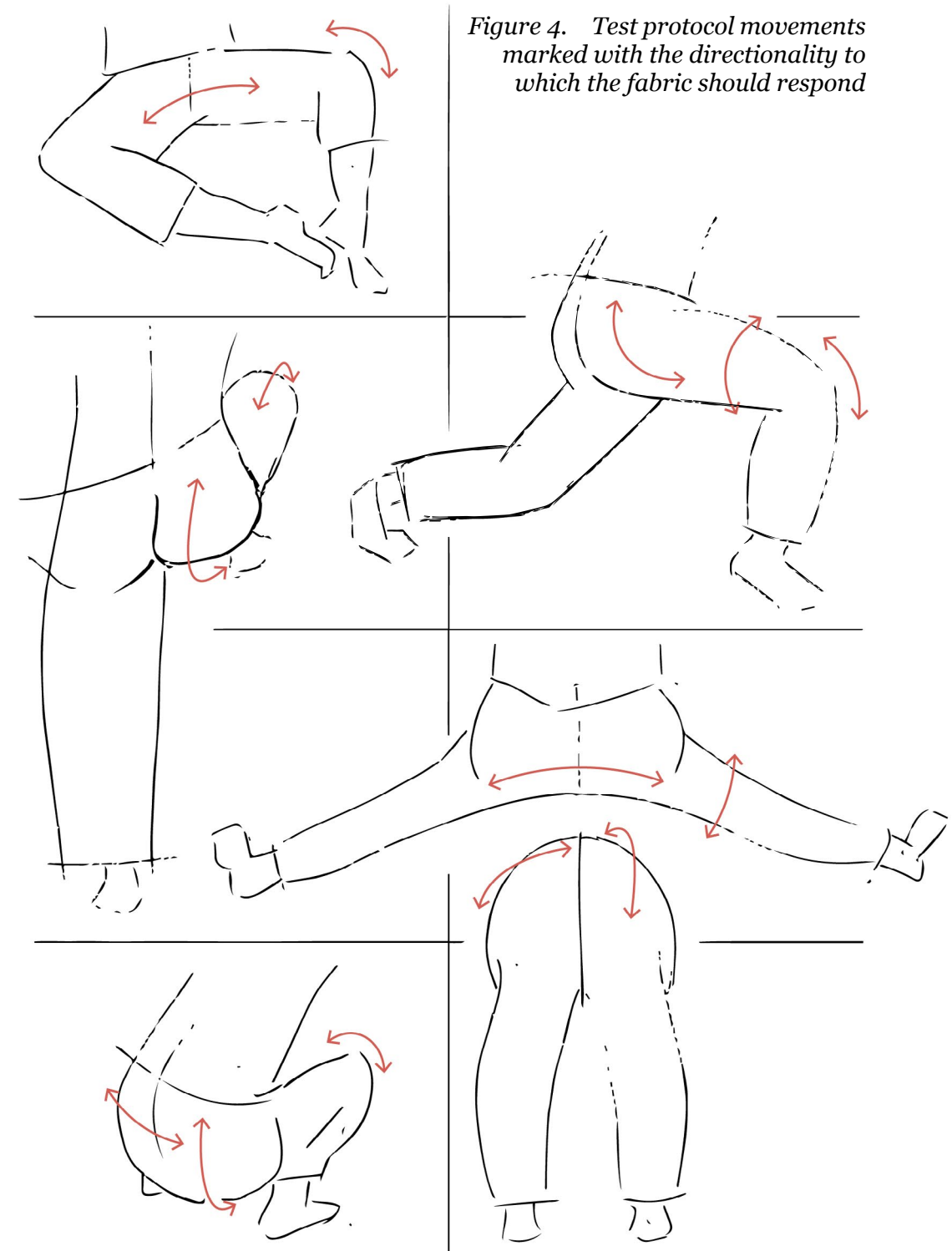


Figure 4. Test protocol movements marked with the directionality to which the fabric should respond

It is common that jeans are constructed with a red selvedge edge running down the outside leg, i.e. the warp runs latitudinally down the body. This is a traditional fashion production practice. It ensures an efficient management of material usage. However, when I compared this material science with the desired direction of stretch that we marked in figure 4, this traditional practice did not seem logical in terms of comfort. I was curious to explore how the fabric would respond to movement of the body, when climbing trees, if we rotated it by 45°, see figure 5, so that the stretch across the bias aligned with the direction stretch marked in figure 4.



3.2.4. Workshops 5 & 6: reciprocal dialogue between fabric and moving body

Working with Stine, she moved in and out of the test protocol in figure 4 whilst I guided the positioning of the fabric in the correct direction. Collaboratively and iteratively we shaped the trouser pattern.



Figure 5. Moving in and out of the tree climbing positions whilst paying attention to the stretch of the fabric and iteratively extending the trouser leg with each workshop

3.2.5. Workshops 7, 8 & 9: introducing a choreographer to the design process

I was keen to add a second moving body into my design process. I was advised by my strategic partners (that I will introduce in section 4) that I should focus on going deep on the development and testing of one prototype. That means focusing on one gender and one size. This might seem counterintuitive to an inclusive design process. However, this is the salience that is required at this point of the process rather than more generalisation. When one prototype is perfected, the intention is to extrapolate and expand for a more diverse range of genders, sizes and body types.

I was also curious to bring another expertise into the process. I invited my friend Rannei, a dancer and choreographer; an expert in movement and its vocabulary. Rannei is female and has a physique similar to Stine. From a practical perspective this allowed for us to increase the number of iterative workshops when Stine was not available due to her studies and a short sickness. Rannei is accustomed to maximising creative collaborations. She is also accustomed to being fitted by a costume designer, and quite often having the costume restrict the movements that she has carefully choreographed. Rannei is also adept at being used in a creative process; translating the movements and meanings of others. This was an enriching process that I have not yet had the time to fully reflect on;

but one that I would like to grow further with both Stine and Rannei, allowing a merging of their lived experiences to flourish and enhance.

In a continuous process, the knowledge from each workshop was translated into the next prototype. The prototypes became more than material artefacts. They became a form of visualised knowledge transfer. Each prototype became a visual map on which I marked the results of the test protocol as well as the notations I needed as a designer. The wearer/ research participant could also manifest their aesthetic preferences.

This prototyping phase is not complete. There is of course more to be considered and tested in terms of the waistband, the zip, the hardware, the pockets. How do these impact the movement and sensory experience? However, how I might prototype these in my personal fashion design practice is not compatible with how it might be produced in mass production. Therefore it is necessary to explore further with the strategic partners that I introduce in the next section.

Figure 6. The prototypes when they are taken off the body and flattened; these are communication tools used with strategic industry partners for the next phase of the project



4. Impact

This report has already established that clothing design solutions are critical to mitigate the sensory challenges faced by the neurodivergent community. It has set out a dynamic design process as an antithesis to the static conception in contemporary fashion design and production processes. However, the greatest barrier to producing sensory friendly clothing are the limiting design and manufacturing processes that dominate today's fast-fashion clothing production.

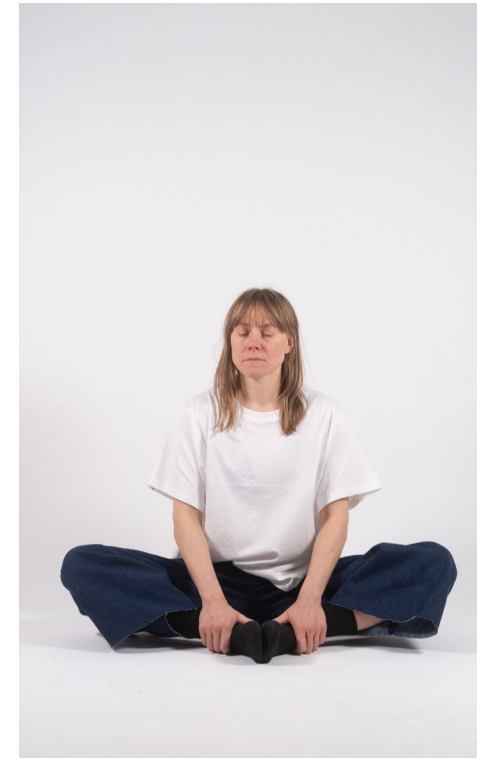
The greatest impact of this pilot project has been the body of work produced which I have been able to leverage to communicate with potential design and manufacturing partners to sustain this project into its next phase. The first step has been to communicate neurodivergent clothing needs to strategic industry partners; getting them to listen and take note, to care about the underserved community and see its market potential. Secondly, the fellowship has allowed me to demonstrate that knowledge can be translated into a design process through this product case study. The evidence is contained in the toiles (garment prototypes) developed on two moving bodies, see figure 6. They work quite literally as body movement maps, indicating how the fabric should respond to these movements. Although our 3D embodied workshops are not traditional ways of designing clothes, the 2D output when the toiles are taken off the body can be understood by the industry partners

and translated by them into their process.

There are two main collaborations that have been set in motion as a result of the pilot project.

1. In December I will learn kinetic garment construction from Rickard Lindqvist at the Swedish School of Textiles. It is a technique that's point of origin is the interaction between the anisotropic fabric and the biomechanical structure of the body and its translational and rotational movements. It is the antithesis of the traditional tailoring garment construction that I was trained in which is based on a person standing upright: flat, 2-dimensional and static. Unlike this prevalent technique, Lindqvist adopts a different technique inspired by the Langer lines of skin tension; topological lines drawn on a map of the human body used in medical surgery. These lines map how the body naturally moves. It is a process of working with the body outwards. The result is the construction of flexible garments that respond to the living body and its natural movements, as opposed to garments that restrict and fight against the body. (Lindqvist, 2015)

Figure 7. The final workshop of the pilot project, with Rannei, where we made and tested an indigo version of the cream fabric. This is by no means the "final prototype" but another iteration closer to the next phase with industry partners.



2. In September I applied for inclusive design support, in partnership with Manufacture in Oslo, for the next phase of this project in 2025. Manufacture Oslo's team is familiar with the use of kinetic pattern cutting and have extensive experience with digital technologies and processes, in relation to the green transition in the European fashion industry, that are inherently sensory friendly. For example, digital clothing production technology offers many possibilities for seamless garment construction, alternative labelling, greater control and variety of the fibre input and texture output. This will revolutionise the tactility of the product. Digital clothing production technology is also efficient, affordable, zero-waste and scalable. This demonstrates the entrepreneurial ambition of this project within the CCE, to ensure that the results are accessible to its target audience and therefore have optimal impact on the neurodivergent community.

5. Learnings and contributions for CIRCE

Through the implementation of this pilot project I learned a great deal about inclusive design processes that can be of benefit to the CIRCE community. Firstly, to be truly participatory is to acknowledge that one must not design for, but with, the end-wearers of the clothing. This is what I define as inclusive design: a process that actively includes people

with diverse lived experiences to explore ways to improve their own lives. Inclusive design celebrates the idea that to thrive we all have different physical needs. At the same time, it finds universality in people's desire to access the same emotional and relational experiences. Within the context of this particular pilot project I do not consider the needs of my neurodivergent participant's as special. Rather, they are amplified universal needs. Everyone benefits from the ability to find their own sensory equilibrium. It is, however, important to note that the concept of universal design is not always appropriate. In a different context with the needs of a different community the concept of adaptability might be more appropriate.

Secondly, the project also demonstrates that there is potential to disrupt traditional design and manufacturing practices in the European fashion industry. With the next phase I hope to demonstrate that the very intimate way of working in this pilot project is scalable and transferable to mass-production processes, intersecting with improved sustainability. This builds on the work of one of CIRCE's 2023 fellows, Silke Hoffman, whose work I am greatly inspired by.²

² <https://creativeimpact.eu/en/creative-impact-fund/embrace3/>

6. References

- Daniëlle Bruggeman (2018). *Dissolving the Ego of Fashion* Engaging with Human Matters. Artez Press.
- Fletcher, K. and Klepp, I. G. (ed.) (2017). *Opening up the Wardrobe: A Methods Book*. Oslo: Novus AS.
- Lindqvist, R. (2015). *Kinetic Garment Construction - Remarks on the Foundations of Pattern Cutting*, The Swedish School of Textiles.
- Robertson, A. E., & Simmons, D. R. (2012, April). The relationship between sensory sensitivity and autistic traits in the general population. *Journal of autism and developmental disorders*, 4(43), 775-784.
- Roberston, A. E., & Simmons, D. R. (2016). The Relationship Between Self-Reported Sensory Experiences and Autistic Traits in the General Population: A Mixed Methods Analysis. *Focus on Autism and Other Developmental Disabilities*, 33(3), 182-192.

7. Acknowledgments

My biggest thank you must go to **Stine**³ for inspiring this project and her vulnerability in lending her bodily experiences and sensory apparatus to the design process. Her time is precious and I am eternally grateful that she spent it on this research project. Within the PhD research it was not possible to compensate her for her time and knowledge. It was very special that the CIRCE funding allowed me to employ her as a collaborator.

I would also like to thank **Erik** for his participation in the climbing workshops.

Choreographer, movement expert (and documentation model) was **Rannei Grenne**. Her participation was supported by Trondheim Municipality's "kunst og kultur" fund.

All photography by **Anders Myklebust**.

³ Stine is a pseudonym as she wishes to remain anonymous