Tactile Narratives: Augmenting Body Maps through Textured Fabric

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ABSTRACT

In Human-Computer Interaction, body maps are a standard tool to understand an individual's bodily phenomenon. Body maps often use abstract drawings and text annotations on an outline of a body. However, little research has explored alternate ways we can collect similar data. In this pictorial, we present tactile body maps, which use an array of textured fabric circles attached to a felt-shaped body instead of a more traditional approach to drawing body maps. We first present an illustration of how researchers can use tactile body maps and show an example of the type of data collected in the method. We then tested the augmented body map method alongside drawing body maps and verbal-only body descriptions with eight participants to explore the benefits and disadvantages of each technique. Through the data, we present a set of considerations that a researcher can use to decide which way would be most appropriate for their soma design process.

Author Keywords

soma design, design research methods, somatic design, body-centric design, body maps, materiality, embodied experiences, experiential design, research-through-design

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CSS Concepts
• Human-centered computing → Interaction design process and methods.

Introduction

In human-computer interaction (HCI), specifically in soma design, body maps are often used to help individuals describe a phenomenon they experienced through graphical representations [2, 12]. Though used differently in other research communities, HCI uses the body map method to get individuals to draw, scribble, and write on paper after their experiences. Then the drawings are analyzed by the researchers and used in their design process [2].

In this pictorial, we contribute to the TEI community by proposing an augmentation of the body map method, which uses textured fabrics attached using hooks to a body-shaped piece of felt. While exploring the tactile body maps, we are interested in individuals' thoughts and experiences while participating in a study using drawing body maps and audio-only body descriptions. We propose to extend the work Vidal et al. [12], which explored how alternate materials could enhance drawing body maps and explore instances where verbal-only body descriptions, drawing body maps, and tactile body maps might be beneficial. In this exploratory work, we ask the following research questions: (1) how do tactile body maps, employing textured fabric as a medium, compare to drawing body maps and verbal-only body descriptions? (2) What are the three methods' benefits and disadvantages?

To answer our research questions, we facilitated mindfulness meditation exercises with eight participants and explored the three methods using counterbalancing to describe their meditation experiences. Afterwards, the respondents participated in a short semi-structured interview. Through analyzing the data using thematic analysis, we developed a set of design considerations to choose which method would be most appropriate for your study.

Drawing Body Maps

Soma design is a research area in HCI that explores individuals' embodied experiences, encompassing subjective understandings of ourselves in areas such as body sensations and emotions. It aims to leverage this understanding to elucidate the relationship between individuals and technology, informing the design process [6, 9]. Within soma design, body maps allow researchers to understand and collect meaningful data from complex felt sensations [2]. Previous work emphasizes the importance of physical representations of the bodies to support different experiences to explain verbally [2]. However, there has yet to be a comparison between more art-based visual methods and a more traditional interview for design research.

Traditionally, body maps are drawn on paper, with researchers using previously drawn outlines or giving the individuals participating in the study the freedom to draw outlines representing their bodies. Then they use different symbols in various colours they feel describe their experience along with text annotations around the bodies [2]. To explore alternate representations of body maps, Vidal et al. [12] generated six distinct themes that can be used as probes, and the researchers hoped they would inspire future augmentation in the body map method. A notable aspect that interested us in their research is investigating alternative materials to depict somatic experiences that are occasionally overlooked in traditional body mappings.

Limitations Around Traditional Body Maps

The inquiry into various materials and the quest to augment the body mapping method originated during the first author's pursuit of autoethnographic data. Owing to a disability that affected their writing, they observed a recurring sharp pain in their hands when documenting daily experiences on body maps with a pen. While some researchers have explored alternative body maps [12, 11], to our knowledge, researchers have yet to develop solutions requiring limited hand movements and strength. This observation prompted exploring alternative approaches to capturing similar data without requiring them to write. Given our predominant focus on wearable technology design, our familiarity with fabrics and materials presented an intriguing avenue to delve into somatic experiences. Leveraging this existing expertise, we investigated how fabrics and textures could serve as a means to alter traditional body maps.

Interrelationships Between Textiles, Emotions and Sensations

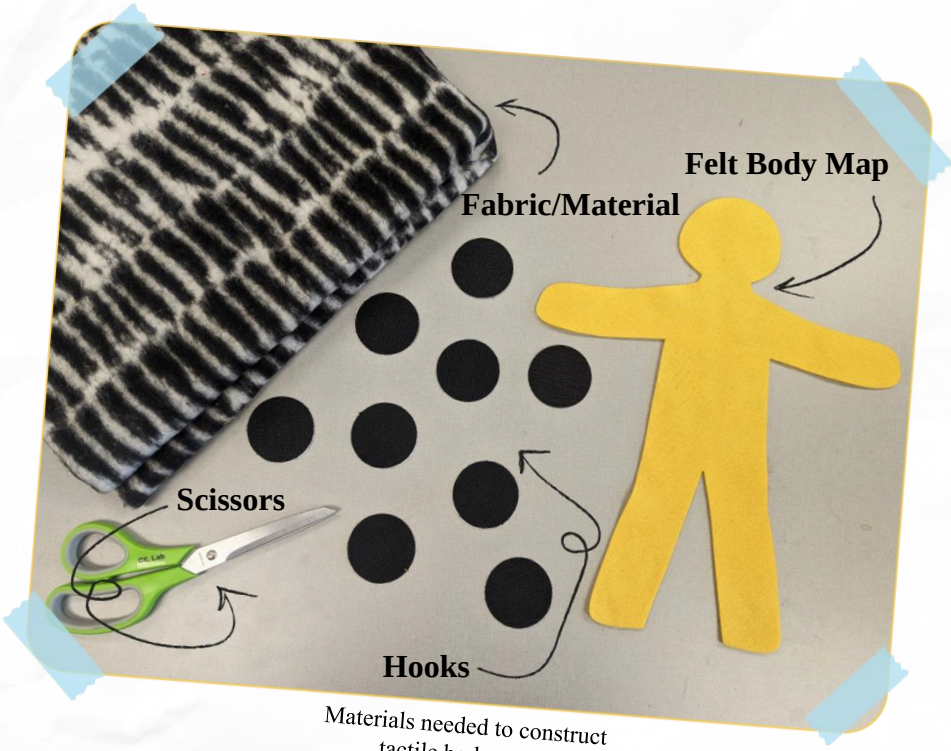
Textiles are highly personal; feeling them can remind us of memory or give us specific sensations. For example, touching a soft thick fabric might make the individual feel physical comfort or warmth [5]. Moody et al. [10] describe the textured fabric as a form of communication that they describe as "oral textures," which connect specific textures to various emotions, cognitive, and mood associations. Though limited in scope, they describe specific fabrics to include labels such as satisfied, loving, compassionate, tranquil and blurred [10]. We employed these labels and fabrics connected to the emotions, cognitive, and moods with particular fabrics as a foundational framework with additional fabrics and materials that we felt encompassed a comprehensive spectrum of emotions and sensations. Nevertheless, we remained aware of the potential omission of certain fabrics and textures and will rely on participant feedback to fill in the gaps.

Example of a Drawing Body Map

Designing the Method

Extending Moody et al. [10] catalogue of oral textures, we spent a considerable amount of time inspecting fabric and materials to a range of emotions inspired by Keltner's 20 – 25 states of emotion [7] and drawing from Kornfield's work on articulating somatic experiences of novice mindfulness practitioners' [8]. Achieving a complete representation of textures for every conceivable emotion and sensation remains an unfeasible task. Nevertheless, we made every effort to encompass a broad spectrum. Subsequently, our rigorous exploration led us to use 21 different textures in our preliminary study. To attach them to the felt body map, each fabric was cut out and attached to the hooks using a self-adhesive already attached to them.

Although our body maps feature standard non-gender specific shapes, they can be readily adapted better to fit various communities, body shapes and positions. For example, you can easily change the position to make the body map sitting down, change it to a smaller or larger body, and even inclusively represent people who use assistive technologies.



Materials needed to construct tactile body maps

How to Use the Tactile Body Map

Before the individual uses the tactile body maps, they should either engage or recall a somatic experience. We opted for our participants to engage in a 5-minute mindfulness breathing exercise.

Upon completing or recalling the experience. Individuals should explore the tactile circles and discern which one most accurately embodies their emotions and sensations. We specifically guided our participants to ignore the colours and concentrate on the textures.

Individuals would then place the tactile circles onto the body map aligning them with the body part they perceived as most closely connected to the origin of the emotion or sensation.

As our study included participants and was not an autoethnographic experience, we then directed our participants to elucidate the rationale behind their texture choices and recall their somatic experiences during the meditation exercise.

Study Design

To answer our research questions, we tested the method alongside drawing body maps and audio-only descriptions with eight participants to examine whether our proposed augmentation could be used in the somatic design process. We used a phenomenological approach to collect and analyze our data [4]. We received ethical clearance from our institution's ethics committee.

Participants

We recruited eight participants (four females and four males) through word of mouth. Participants were aged from 22 to 42 (with a medium age of 24.5). One of our participants self-identified with having a disability. Our study included three people in the industry focusing on design, two undergraduates (engineering and economics), and three graduate HCI researchers.

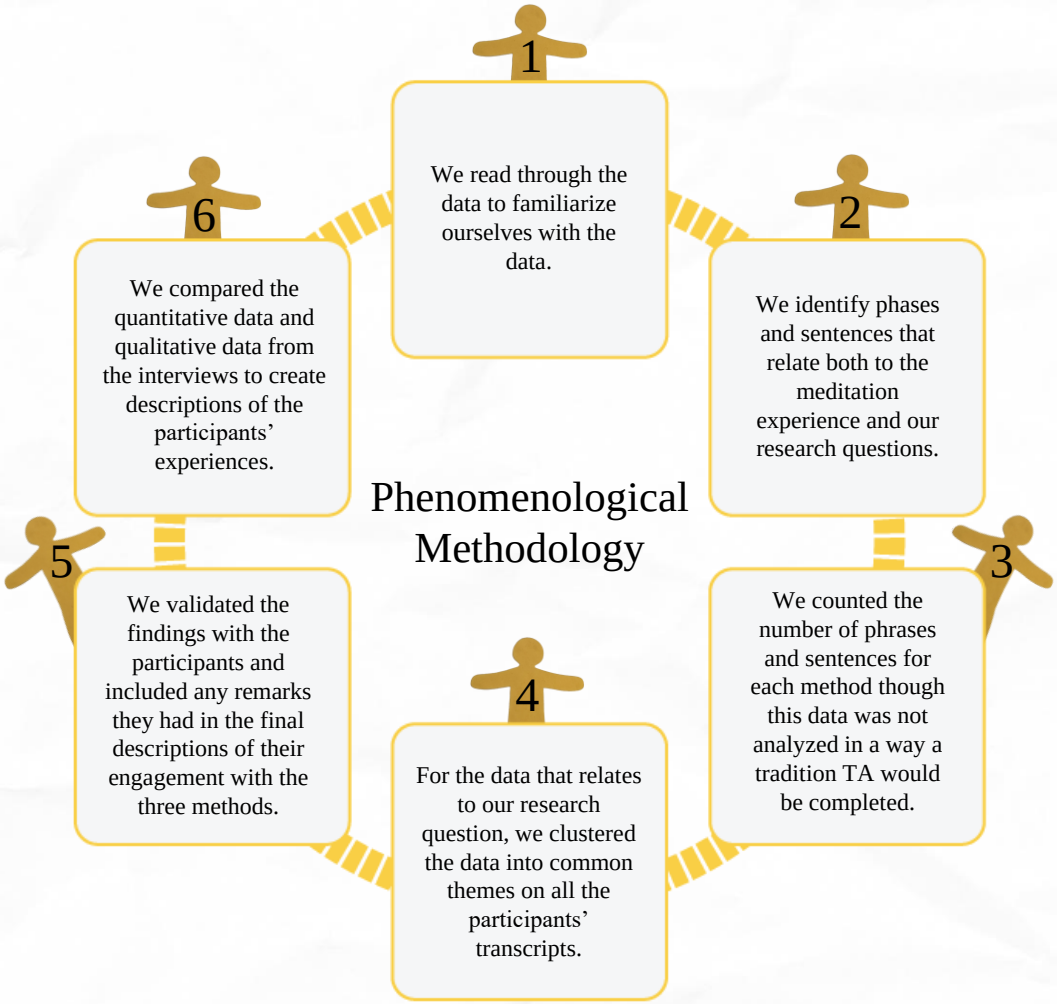
Procedure

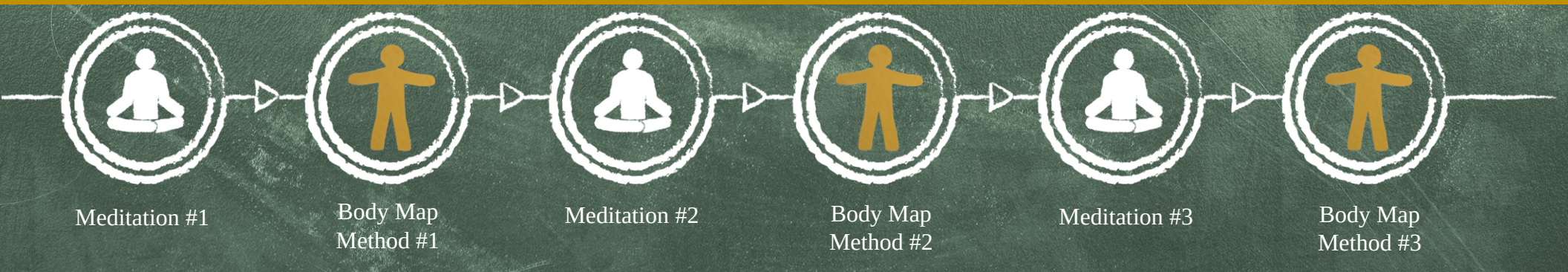
Participants tried each of the three methods using a counterbalanced technique. We also counterbalanced three meditation exercises, including two breathing exercises and a short body scan. Each exercise lasted 5 – 8 minutes with the whole study protocol lasting around 1 hour and 15 minutes. The first author, a trained meditation practitioner, facilitated the activities. After the meditation exercise, participants were instructed on which body map method they were exploring, including drawing body maps, tactile body maps, and verbal-only body facilitation.

Regarding the tactile body maps, we arranged the felt body maps and tactile circles on the table and provided instructions similar to those detailed on the second page of this paper. We wanted to limit the choices, therefore, we choose circle shapes as they feel more organic than harder shapes such as squares. Secondly, we pre-cut body shapes to reduce the study length. We also instructed the participants to feel the textures and ignore the colours. As for the drawing map, participants were instructed to draw outlines corresponding to their bodily perception, either realistic outlines or abstract representations they felt were appropriate. After the drawings were completed, our participants were instructed to use coloured markers to draw and encouraged to supplement their drawings with written annotations if deemed beneficial. Upon completion, participants explained their symbolism, colours, and textual elements presented in their body maps. Lastly, individual interviews were conducted with the first and second authors regarding verbal-only body facilitation. We used probing questions and laddering techniques to elicit a comprehensive understanding of their embodied experiences during the mindfulness meditation exercise. Upon exploring the three methods, we conducted open-ended interview questions with the participants inquiring about their perceptions of each method, the aspects that were effective and those that caused them frustration, and their preferred approach.

Analysis

To analyze the data, the first and second authors used a phenomenological approach employing thematic analysis drawing inspiration from the method used by Anderson and Spencer [1].





Results

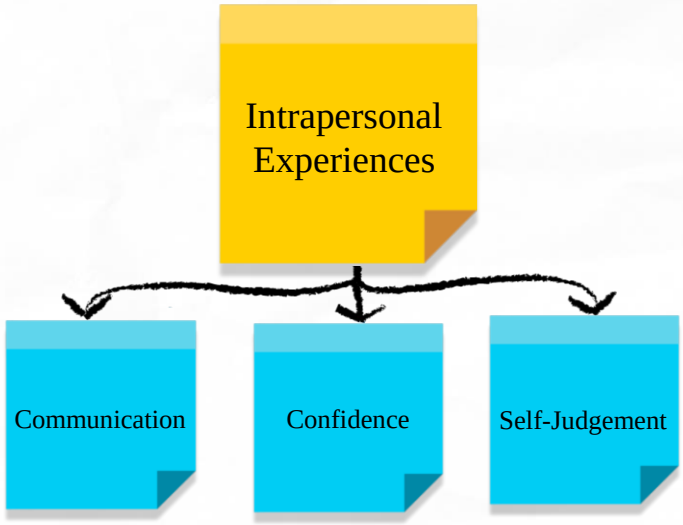
Intrapersonal Experiences

In our study, participants had conflicting experiences with the three methodologies. In the verbal-only body descriptions, some participants found it challenging to find the appropriate words to describe their experience. P2 emphasizes this by explaining, "*I realized that I had less vocabulary, but in some ways, I was missing touch or the textures or picking out a colour*." P7, who's first language is not English added that "*the drawing and textures were great because we don't have the language barrier*." Not everyone felt the textures decreased their cognitive load. P4 noted that they found connecting textures to their emotions and sensations challenging. "*I guess it's easier to put it into words than use things like colours or fabrics. To explain how it feels*."

With drawing body maps, a few participants noted that they judged their sketching skills. P8 noted that they struggled with the drawing "*because I know I suck*," whereas P2 went into more detail about their frustration with the method. "*I was expecting you to give me a very, inside of a box explanation. Choose the red colour for pain and the blue for [relaxation] or something like that…I need to develop a colour system to express this thing that is inside of it."* The participant noted that they were worried that their self-judgement while drawing would affect the data. P7 also agreed with this point, noting that "*my drawings are really horrible so I was able to describe with [the tactile body maps] and [not] being limited to that*." However, there were other participants not burdened by judgement and found the drawing easier than the textures. P4 explains that they "*think it's easier to put sensations into colours. Rather than, like the feel of the fabric*."

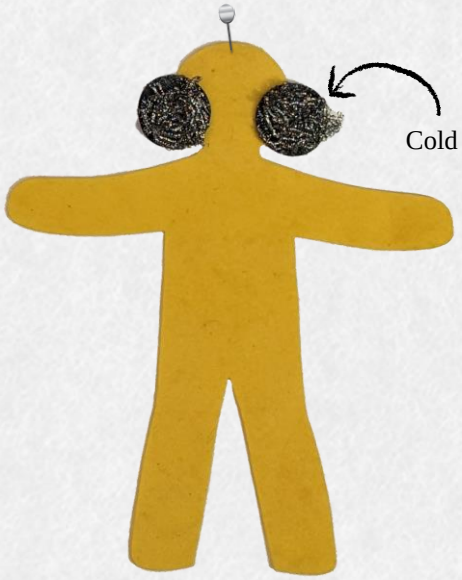
Holistic Experience

Overall, participants found the instructions fairly easy to follow. Like other participants, P5 notes that "*the instructions were good overall*." Participants found creative ways to depict complex emotions and sensations. On pages eight and nine, we show some of the ways that participants described the fabrics. Notable examples are below for some exciting ways participants used the textures and colours.

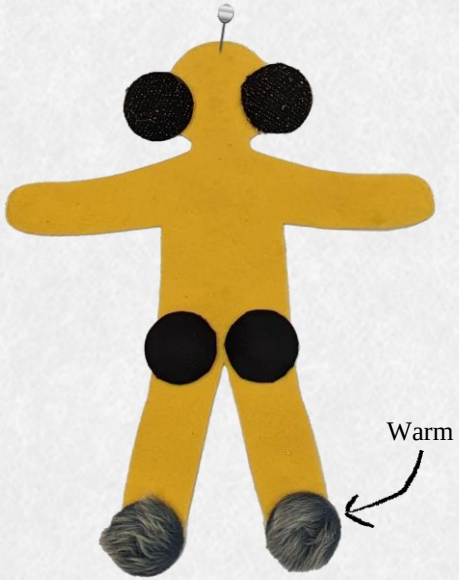


Intrapersonal Experiences and the TA theme subcategories.

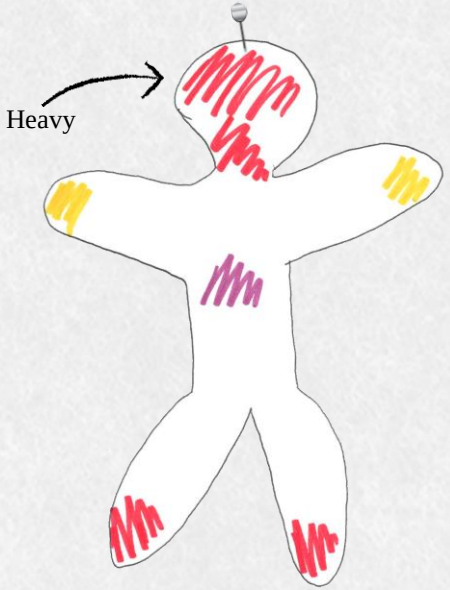
P5 Front After Meditation



P3 Front During Meditation



P4 Front During Meditation



P4 Front After Meditation

Participants noted that the tactile and drawing body maps were a very playful approach. For instance, P2 noted "*It was a very smooth transition from what I was feeling to choosing the texture or choosing the colour*." And both looking at the number of datasets that we received in the study and their responses, many participants agreed that having a visual representation of the somatic experiences assisted then in recalling details in their experience.

Adaptability

Participants noted that they were also easier to showcase both external and internal emotions and sensations on the felt body maps. P6 adds to this by explaining that the tactile circles can easily represent "internal [sensations]…Sort of easy to take a scratchy material and use it to represent something like tinnitus, which is sort of a scratchy experience." However, there were also suggestions from the participants to help support the creative process with using body maps. P6 suggests alterate ways people could draw the outlines of the body maps. "I think of that sensory system drawing [in] textbooks with guys like large nose, large ears, very large head, but then sort of like shrunk in [the] trunk with fingers and hands and things like that. Massive feet…because that's where the most nerve endings are. They have the most discrete sensation that at least for me would have served well diving into them. You know, I'm feeling a lot around my face and I have a big face to work with relative to the pieces."

Subjective Viewpoint

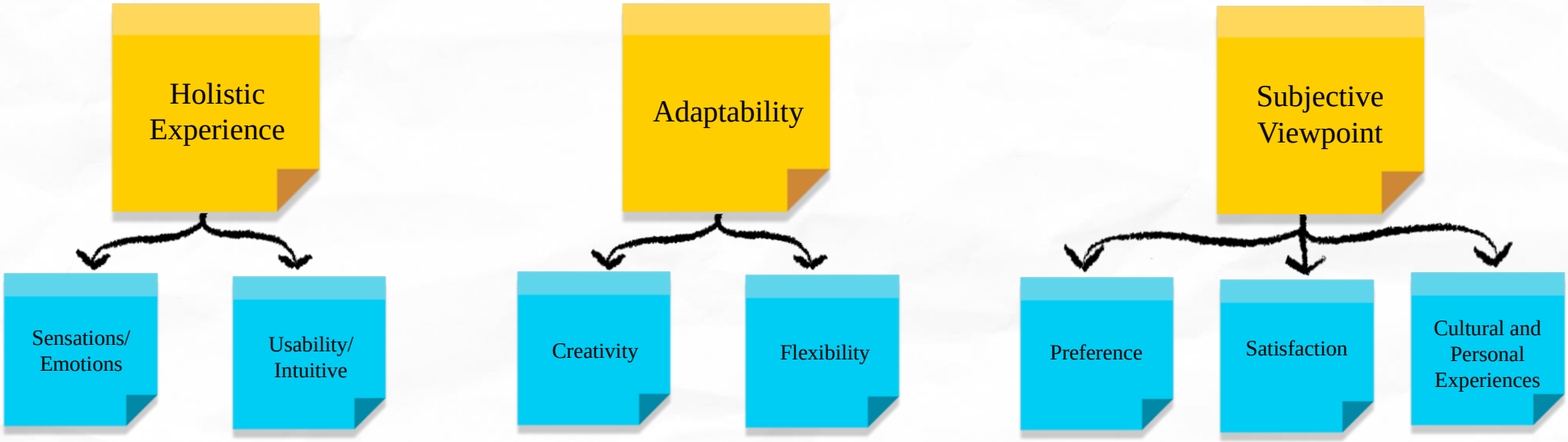
Two participants preferred the drawing body maps, four the tactile body maps, and two the verbal-only body descriptions. Participants were highly critical of their sketching skills for drawing body maps. However, when counting the number of qualitative phrases or sentences in the body maps, P1 who preferred verbal gave a deeper description during their tactile body map and P8 who also preferred verbal gave more data points during both their drawing and tactile.

Colours often have cultural connections. P5 explains "I think that the colours of the drawing, one can sometimes feel kind of arbitrary or externally influenced by…[for example,] red is bad, blue is calm, green is good kind of thing. So I felt like I was sort of led by societally decided meanings of colours." Whereas when P5 discusses fabrics, "I feel like that could be like very different for everybody because everyone has a different experience with fabric and texture." All 8 participants noted personal experiences with the textures and did not make any culture connections.

Overall, participants found both drawing and tactile body maps helpful probs to help articulate their phenomenological experiences. And even participants noted they preferred other methods and found the tactile body maps a relaxing and enjoyable experience. P8 reflects on the experience by stating "if you're trying to, to decompress or whatever. Maybe the fun one [tactile body maps] would be more interesting. And if you'd want like to solve…[stress or you] just like you have a long day at work and you just want to do something that's easy and fun."

	Audio	Drawing	Fabric
P1	8	6	12
P2	12	12	15
P3	5	12	10
P4	8	10	12
P5	6	9	10
P6	24	39	38
P7	4	9	31
P8	6	8	19
Mean	9.125	13.125	18.375

Number of Data Points Per Method
Per Meditation Exercise



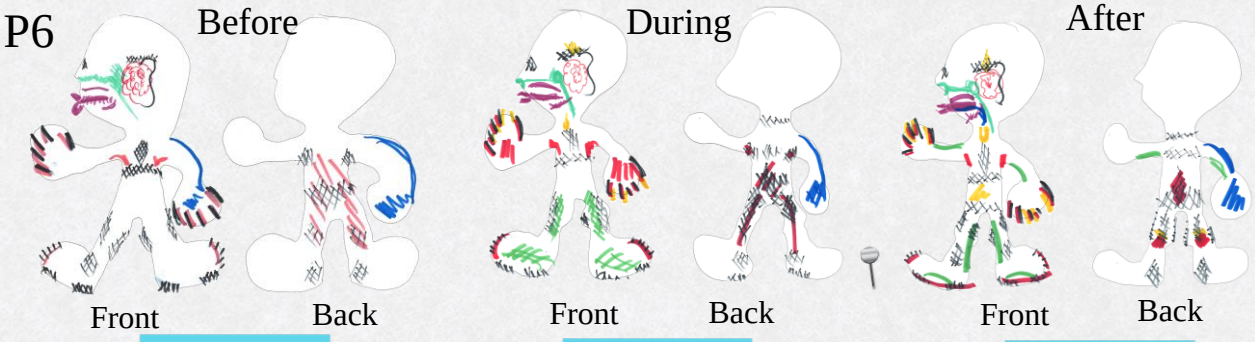
TA Themes and their Subcategories

Drawing Body Maps

During the meditation session, the participants were asked at the beginning, middle, and end of the session to imprint, which is a method to start at the top of the head and move down to to the toes to notice any thoughts, emotions, and sensations. These imprints were then visualized on the body map and presented to the research team after the meditation session. After the session, traditionally, we would use the data to use thematic analysis to understand how the interventions affect the user and what we can design to support the process.

Often body maps are used alongside other methods (for example, Cochrane et al. [2]). However, for this work, as we were more interested in understanding and comparing the ways to answer our research questions, we only counted the number of phrases and sentences participants used to describe their experience. Below are a two of the body maps developed through the meditation process with textual annotations written by the research team.

P6

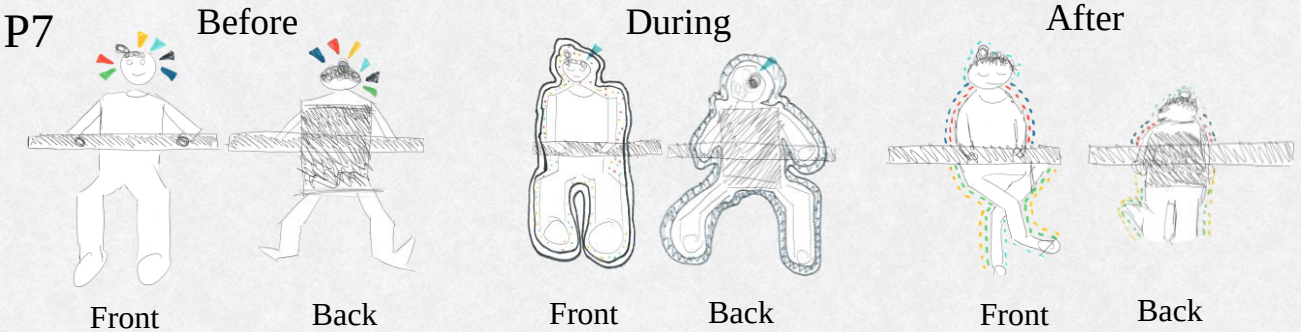


- Feel clothing on body
- Very aware of body parts

- Still aware of whole body
- Felt the cold air

- Felt pulse and breathing
- Still aware of whole body

P7



- Focus on everything
- Stimuli
- open

- Relax
- Focus on me
- Voice only

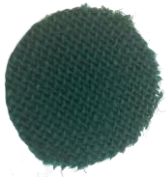
- Calm
- No stimuli
- Open

Fabric Collection

Participants exhibited diverse and unique applications of the tactile circles, as evidenced in the following two pictorial pages.

The selection of textures, as expressed by our participants, stemmed from their perspectives, experiences, and reflections on past encounters. Subsequently, the choices might vary if a different participant group was involved. Nonetheless, our findings hold significant value for the HCI community, particularly those interested in utilizing textures to collect data on somatic experiences in future studies.

Burlap



How it was used:
- Stress
- Sore
- Buzzing

Canvas

How it was used:
- Sore
- Tight

Cotton Knit

How it was used:
- Bandage
- Skin

Faux Leather

How it was used:
- Heavy
- Grounded
- Hard

Flannel

How it was used:
- Warm
- Fuzzy

Fleece

How it was used:
- Soft
- Cozy
- Warm

Jersey Knit with Thread

How it was used:
- Light
- Floating

Jersey Knit

How it was used:
- Playful

Long Hair Fur

How it was used:
- Warm
- Cozy

Loops

How it was used:
- Fluffy
- Bouncy

Medical Bandage

How it was used:
- Tension
- Sore

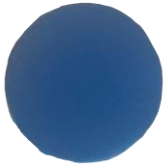
Monk's Cloth

How it was used:
- Cold
- Hard

Neoprene

How it was used:
- Bouncy
- Floating
- Light

Ripstop



How it was used:
- Cold

Sandpaper

How it was used:
- Smooth, Fuzzy
- Itchy, Tingly
- Tension

Fabric Collection Continued

Short Hair Fur

How it was used:
- Warm
- Soft

Softshell

How it was used:
- Bouncy
- Light

Steel Wool

How it was used:
- Cold
- Pain, Itching

Thick Wool

How it was used:
- Warm
- Heavy

Tulle

How it was used:
- Itchy, Poking
- Light

Waffle Terry Cloth

How it was used:
- Tight
- Tingling

Fabric Suggestions From Participants

Cardboard

Suggested Uses:
- Smooth
- Raw

Coarse Grit Sandpaper

Suggested Uses:
- Pain
- Tension

Plastic

Suggested Uses:
- Cold
- Smooth

Silicone

Suggested Uses:
- Support
- Neutral

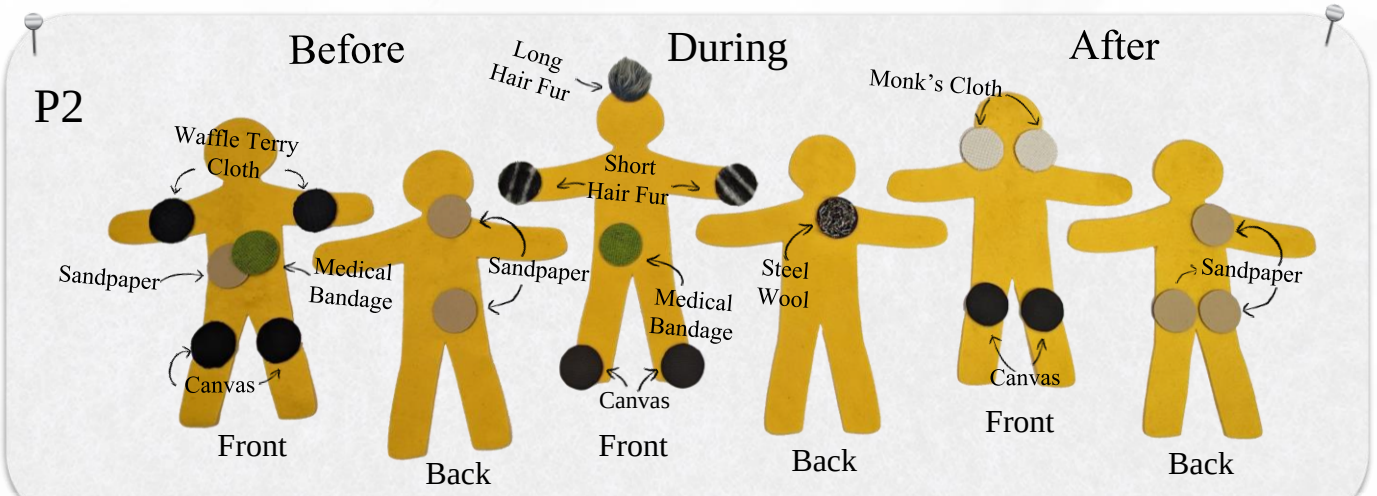
Velvet

Suggested Uses:
- Light
- Soft

In our semi-structured interviews, participants also noted some ideas for additional fabrics. Though it would be impossible to include every suggestion as the benefit of using tactile body maps is the limitations in fabrics, we note that these five pose unique opportunities to showcase a range of emotions and sensations that would be difficult to do with the current set of fabrics and materials.

Tactile Body Maps

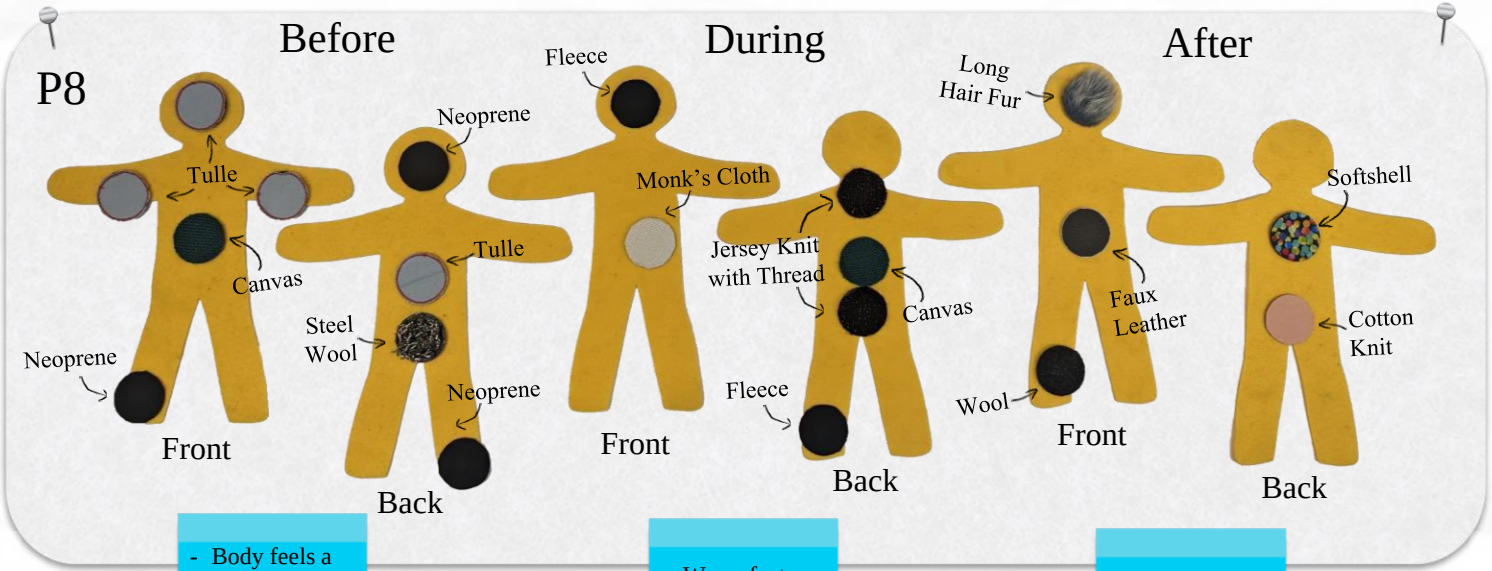
In this section, we showcase several examples of our tactile body map method designed by the participants in our study. Like the drawing body maps, participants imprinted any thoughts, emotions, or sensations at the meditation exercise's beginning, middle, and end, forming the maps' basis. Further information on how the participants used the tactile circles can be found on the previous pages.



- Stomach ache
- Sore knees

- Meditation making head feel fuzzy
- Noticing shoulder and feet sore

- Notice chair
- Notice knees sore again
- Shoulder less sore



- Body feels a bit more relaxed
- A bit of back pain

- Warm feet
- Nothing going on in the lower body

- Fuzzy head
- Back pain reduced

Data Validation

After analyzing the data, we shared it with our eight participants and asked them if they had any additional comments. P1 suggested that sharing the tactile circles before introducing the body maps might help reduce the concerns of cognitive load. Besides that participant, no one else had any additional comments.

Discussion

It is imperative to acknowledge that this endeavour constitutes an investigation into the augmentation of the body map method, comprising a modest preliminary study. However, the insights from this work guide other researchers and support them with the design of future research studies. Note as our participants were novice somatic practitioners and not used to eliciting somatic experiences, these design guidelines pertain to beginners. More data would need to be collected for more advanced practitioners.

Cultural vs. Personal Experiences

None of our participants brought up cultural connections to the textures but rather focused on personal experiences. Previous research by Cochrane et al. [3] also found similar findings but found their work ignored cultural connections to colours and focused on the user's preference. We found that when participants ignore cultural connections, they gain the ability to be more creative. If using drawing body maps, we encourage researchers to use language in their instructions and encourage participants to disconnect from cultural norms and focus on personal experiences when developing their body maps.

Reduction of Cognitive Burden

Firstly, we suggest that researchers have alternate instructions. Some participants might benefit from supplementary guidance and exemplars. Secondly, if participants struggle to map bodily experiences to the tactile circles or colours, you can introduce the materials before the body maps. Some participants prefer to be given an outline rather than having to draw their body maps. Others might need instructions to draw their bodies in different poses or enlarge specific body parts, which they noticed have more details in the emotions or sensations to have a larger area to work with.

Another aspect to think about was the flexibility of the method. Some participants preferred the openness of using colours to draw body maps, whereas others thought it was overwhelming. It will be beneficial to get to know your participants and understand their cognitive ability to reduce the burden of judgement to get more meaningful data from the participants.

Flexibility in Design Methods

Similar to other researchers' justification on why body maps are a helpful tool in HCI [2], we found that adding a drawing or tactile body map increased the number of data sets than verbal-only body descriptions Nonetheless, a reduction in sentences or phrases describing experiences in the drawing body maps was evident, attributable to participants' diminished confidence in their artistic ability. Considering that somatic experiences are deeply personal and may involve portraying emotionally charged experiences, we recommend that researchers be ready to offer support by being open to modifying their methods or assisting the participants as needed. Our study observed that when participants received desired support, the data increased in richness and depth.

Secondly, exploring the methods allows you to see the different types of data you can collect with the methods. Drawing body maps made external sensations easy to showcase, whereas tactile body maps could better articulate internal sensations such as temperatures. From our experience, if researchers are interested in understanding somatic lived experience, we suggest using a design probe such as tactile or drawing maps over verbal-only body descriptions. Participants noted that the circles were an appropriate size and shape and helped keep the tactile body maps simple. They did however, note that they would have liked to cut out their own bodies or have bodies in different shapes, sizes, and positions.

Limitations, Future Work, and Conclusion

Our study presents a preliminary exploration to assess the viability of our proposed augmentation for body maps called tactile body maps. The method employs tactile fabric and other materials as a medium. With eight participants, we explored and compared the tactile body maps with drawing body maps and verbal-only body descriptions. We discuss the methodological challenges encountered during the study, which included participants' preference for the drawing and tactile body maps due to the difficulties of finding an appropriate vocabulary for the verbal-only body descriptions. We also note that participants increased cognitive load with the drawing body maps and the challenges some individuals face in connecting emotions and sensations to the tactile circles.

We found more benefits for participants to explore the more art-based methods of tactile and drawing body maps compared to the verbal-only body descriptions. Interestingly, two participants preferred this approach. For drawing body maps, some participants appreciated the freedom provided by the markers, whereas others found value in the limitations inherent in using the tactile circles. Secondly, it was exciting that participants noted the cultural connections to colours. In contrast, textures and materials might increase reflections on past experiences, which made the method easier to describe inner and outer emotions and sensations of somatic experiences.

Through this work, we employ researchers diving into the soma design process to consider strategies to alleviate participants' cognitive burdens and remain receptive to modifications based on insights gained from collaborative engagement with their participant groups. We hope this study has meaningful insights to support future soma design work. We also hope in future studies to use the method on people with disabilities as well as explore different body shapes. And encourage any researchers interested in the method to reach out to the authors.

Acknowledgement

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