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A toolkit

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Design for serene textile experiences: A toolkit

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Abstract: Serenity plays a pivotal role in human wellbeing, as it fosters an enduring sense of peace and calmness. Everyday textile artifacts, with their qualities of softness, malleability, and flexibility, hold the capacity to greatly enhance serenity in user experiences. Drawing from the foundation of materials experience and material-driven design, this paper introduces a design toolkit aimed at harnessing the potential of textiles in creating serene experiences. The toolkit was refined through two exploratory workshops involving design professionals from both academic and industrial backgrounds. By emphasizing the interplay of form, material, and time in textile experiences, this toolkit offers a vocabulary and set of techniques for discussing and designing for serene textile experiences across different material and time scales. We further explore avenues for the toolkit's employment, expansion, and adaptation for use in a wide array of material-driven design projects.

Keywords: Materials Experience; Serenity; Textiles; Design tools; Wellbeing

1. Introduction

In 2019, 301 million people worldwide reported feelings of anxiety (WHO, 2022). While we know how critical mental wellbeing is to our individual health it continues to be a problem that individuals—and society—struggle with. During the first year of the COVID-19 pandemic (WHO, 2022), there was a 25% increase in reported anxiety which amplified our collective understanding of how individual mental wellbeing and resilience plays out across society. The experience of serenity—a calming emotion associated with safety and self-connection can reduce stress and anxiety (Boyd-Wilson et al., 2004)—thereby improving our mental wellbeing (Soysa et al., 2021; Stanton et al., 2016).

Design scholars have developed tools to facilitate understanding and evoking positive emotions, including serenity (Fokkinga & Desmet, 2022), and manifested serene experiences in a range of mediums and contexts. These include color (Ji, 2017), sound (Vidyarthi & Riecke, 2013), and natural elements (Kim et al., 2022), for diverse contexts such as products (e.g., Ståhl at al., 2016), wearables (e.g., Van Dongen & Toussaint, 2019) and spatial design (e.g.,

Nourozi, 2018). These studies suggest a diversity of approaches possible and needed for wellbeing in design; however, there is still a need for comprehensive exploration of materiality's role in serene design. In this respect, we focus on the materiality of textiles, a material system showing promise in eliciting serene experiences due to their softness and intimate presence in our everyday life (Adam & Galinsky, 2012; Xue, Petreca, et al., 2023). Yet, research in this area lacks a cohesive vocabulary and tools to support designers seeking to use tangible material outcomes to transmute personal and contextual experiences of serenity.

In this paper, we present a toolkit to facilitate the design for serene textile experiences. The toolkit which was developed through two design workshops consists of four main tools: (1) Serene Experience Canvas; (2) Serene Textile Examples Card Deck; (3) Form-Material-Temporality Map; (4) Serene Qualities Card Deck, aiming to facilitate designers in understanding attributes defining serene textiles experiences and inspire them in designing for serene experiences mediated via textiles. Concluding, we introduce three design approaches for serene textile experiences, generated from the findings' discussion.

2. Serene experiences in design

Serenity is a low arousal positive emotion (Russell, 2003), which is associated with feelings of safety, certainty, and calmness in difficult circumstances (Boyd-Wilson et al., 2004). Recent studies in psychology report a correlation between higher levels of serenity and lower stress and anxiety, resulting in better mental wellbeing (Soysa et al., 2021; Stanton et al., 2016). Serenity has been linked to various benefits, such as connecting with the present and self (Ellsworth & Smith,1988), savoring achievements (Frederickson, 1988; Depue & Morrone-Strupinsky, 2005), and serving as a 'breathing' moment between challenging times in life (Lazarus et al., 1980), allowing individuals to develop a sense of peace and calmness over time (Smith & Kirby, 2010), ultimately reducing stress and anxiety (Boyd-Wilson et al., 2004).

The clear benefits of the cultivation of positive emotions for wellbeing (Desmet & Pohlmeyer, 2013; Stevens et al., 2020) have led design scholars to develop tools and approaches to help designers understand, measure, and evoke distinct positive emotions, such as satisfaction, relief, or relaxation (Desmet, 2012). Yoon et al. (2013) created four design tools, including the "Positive Emotional Granularity Cards," which facilitates a finer grained understanding of positive emotions and help designers improve their ability to articulate and design for those emotions. Desmet (2012)'s typology of 25 positive emotions has been expanded into an online emotion database (Fokkinga & Desmet, 2022), including serenity.

Calmness and relaxation have been explored in studies related to the use of color in game design (Ji, 2017), the use of sound in meditation experiences (Vidyarthi & Riecke, 2013), and the influence of nature-inspired design in virtual reality (Kim et al., 2022). Finally, research in the context of urbanism (Tabb, 2016) and spatial design for health care (Nourozi, 2018) has identified crucial themes for serene spatial design, including material, connection to nature, and multisensory interaction. These works provide valuable insights into the importance of adopting diverse approaches for enhancing human wellbeing.

Although the significance of materiality in conveying serenity has been brought forward in numerous studies, there remains a lack of comprehensive exploration in this area. Furthermore, an emphasis on the impact of interactive technology often compensates for the lack of attention paid to materiality in design for wellbeing. These approaches overlook the potential impact of a holistic understanding of material experiences that lead to serenity in design.

2.1 Serene textile experiences

The notion of materials experience refers to people's experiences with materials in products across four levels: sensorial (i.e., how we sense the material), interpretive (i.e., what we think about the material), affective (i.e., which emotions the material elicit from us), and performative (i.e., what the material makes us do) (Karana, 2009; Karana et al., 2014; Giaccardi & Karana, 2015). Textiles offer an opportunity for designing for serene experiences due to their properties of comfort, softness, and constant interaction with the human body (Adam & Galinsky, 2012; Petreca et al., 2019; Mindel et al., 2023). Larsen (2016) describes the interaction between body and textiles as a constant performative one, and Eco argues that these interactions can shape behavior and thought: "as a rule I am boisterous, I sprawl in a chair, I slump wherever I please, with no claim to elegance: my blue jeans checked these actions, made me more polite and mature" (Eco, 1986:192). Igoe (2021) adds that textile design can activate positive affect and communicate it through their haptic and visual qualities such as color, texture, softness, pliability. Furthermore, their ubiquitous and intimate presence in everyday life, make textiles—if designed accordingly—an ideal medium for facilitating everyday serene experiences.

A serene textile experience could refer to an encounter or interaction with textiles that is characterized by the presence of qualities and attributes designed to promote tranquility over an extended period. Textile qualities that can enhance a serene textile experience include soft, breathable, and plush material qualities, gentle color palettes, and cocooning textile forms. Examples of textile artifacts in this context (Fig. 1) include the cocoon-like Napping Pillow (Ostrich Pillow, n.d.), the inflatable seat Siesta Matter developed by Ainhoa Cortes (The Swedish School of Textiles, 2022), and the site-specific temporary installation Textile Field at the V&A museum (Bouroullec, 2011).

Serenity as a bodily and cognitive experience has attracted scholarly attention over the last decade. Lindeman, et al. (2023) recently investigated the relationship between clothing and mood, concluding that relaxation is associated with comfort achieved through soft and warm materials, along with a loose fit that allows for unrestricted movement. Subtle appearance and sensory stimuli promote a sense of ease and calmness. Other studies on the tactile perception of materials—and specifically textiles—suggest that feelings of security, relaxation, and comfort are associated to silky and soft fabrics, often made from fibers like rayon, silk, and cotton, in contrast to restrictive spandex and itchy wool (Ramachandran & Brang, 2008; Kyriacou et al., 2021).

Figure 1 Examples of textile product for serene experiences: (1) Napping Pillow by Ostrich Pillow; (2) Siesta Matter by Ainhoa Cortes, Swedish School of Textiles; (3) Textile Field by Ronan & Erwan Bouroullec.

In addition, interactive garments can enhance such qualities, providing vibration, heat, and sound. Researchers in Human-Computer Interaction and smart textiles explored the role of design in eliciting serene experiences (Fig. 2), for example by supporting body awareness (Tsaknaki et al., 2021), eliciting mindfulness (Ståhl at al., 2016) and connection with self (Van Dongen & Toussaint, 2019), with others (Choi et al., 2019) or with nature (Coulter, 2023), and stress reduction through breath regulation and compression (Papadopoulou et al., 2019). Such bodily experiences argue for a shift in design and technology from being solely focused on efficiency to considering contemplation and reflection through embodied practices when designing for wellbeing (Höök, 2018).

Research on pattern-changing fabric design and their effect on emotions (Stylios & Chen, 2016) indicates that symmetric patterns continuously and regularly repeating facilitate a calm response. Explorations on affective haptics in smart textile wearables suggests that relaxation and calmness are associated to medium warm temperature and low-pressure tactile input (Price at al., 2022), and to low intensity slow pulsing forces and long constant forces, on the shoulder and neck area, evoking the sensation of a hug or a massage and associations to stillness and feeling centered (Foo et al., 2021). However, these studies focus on the mechanical and electronic stimuli of the artifact, overlooking its textile material qualities, i.e., *textileness* (Buso et al, 2022; Gowrishankar et al., 2017). Petrelli et al. (2016) explore the role of material, form, and temporality in enhancing positive experiences and interactional outcomes with hybrid objects. Their research findings indicate that soft fabrics play a pivotal role in fostering relaxation and creating generally pleasant experiences, surpassing other materials such as solid plastic. These effects are particularly evident when fabric is combined with rounded shapes and vibrating behaviors.

Figure 2 Examples of textile product for serene experiences using interactive technologies: (1) Soma Mat by the Swedish Institute of Computer Science, KTH Royal Institute of Technology, Boris Studio and IKEA; (2) Mysa by Pauline Van Dongen; (3) Affective Sleeve by MIT Massachusetts Institute of Technology.

Within the scope of this area of research, scholars developed tools to characterize materials experientially (Camere & Karana, 2018), select materials based on their 'meaning-evoking patterns' (Karana, 2009), and investigate users' emotional concerns to textiles (Bang, 2007; Xue, Petreca, et al., 2023) to gain deeper insights into user-material relationships (Petersen & Bang, 2016). However, there has been no comprehensive study addressing how to design for a particular emotion with textiles, such as serenity, in material-driven design practices (Karana et al., 2015; Ribul et al. 2021; Buso et al., 2023).

3. Toolkit development

Design tools aid designers in tackling wicked problems with complex interdependencies (Buchanan, 1992; Rittel & Webber, 1973), by fostering reflection-in-action (Schön, 1983; Stolterman et al., 2008), and externalizing design ideas (Dalsgaard, 2017). Furthermore, they can be used in participatory design practice and research, to produce tangible and intangible outcomes (Sanders & Stappers, 2012; Sanders, 2006; Sanders & Simons, 2009; McDonald & Headlam, 2015; Corrigan-Kavanagh and Escobar-Tello, 2020). When designing tools, considerations such as ease of learning, simplicity, and flexibility are essential for quick uptake (Stolterman, 2008; Stolterman & Pierce, 2012). For this reason, card-based design tools, with their tangibility, information accessibility, ease of use, and flexibility in reorganization and updating, have gained popularity in design research (Beck et al., 2008; Lafrenière et al., 1999; Wölfel & Merritt, 2013). For instance, card sets have been developed to introduce techniques for behavior change (Lockton, 2013), design for playfulness (Lucero & Arrasvuori, 2013), and experiential characterisation of materials (Camere & Karana, 2018).

Next to card-based design tools, canvases are a versatile and flexible templated tool commonly used in collaborative design workshops for structuring flexible and iterative design

processes, promoting collaboration and discussion, and communicating design concepts (Aguirre et al., 2017). *Cards and canvases* can be used in participatory workshops to present design attributes, a design vocabulary, and examples, as well as to perform various activities, such as mapping and scenario generation.

Next to cards and canvases, *example* applications can help understand unexplored design spaces by illustrating challenges, showcasing best practices, and demonstrating potential solutions, particularly in collaborative design projects. They inspire new ideas and generate novel directions, expanding the design space by introducing new perspectives. Additionally, they provide a reference point for evaluation, allowing the assessment of ideas and decisions against established standards (Herring et al., 2009). Example applications can help in the mapping activities, for example, to visualize and organize complex information, fostering shared understanding and creativity among the participants (Sanders & Stappers, 2012). Mapping also helps to reveal patterns and relationships between different elements of design, facilitating a deeper understanding of the design space and potential solutions.

Material samples along side example applications can aid tangible thinking (Lockton et al., 2020) in design processes, as they provide physical and sensory references for design exploration, stimulating hands-on manipulation and experimentation, and enhancing the quality and richness of generated design ideas (Heimdal & Rosenqvist, 2012).

3.1 Objectives for designing a toolkit for serene textile experiences

Building on existing work on serene textile experiences and toolkits in design, we underscore the necessity for a toolkit for Serene Textile Experiences, aiming to empower designers to mobilize serenity in their design activities, encompassing reflection, analysis, and ideation. It should offer a structured framework for seamless serenity integration, while remaining adaptable to facilitate iterative improvement, a generative participatory approach, and accommodate diverse design contexts.

Therefore, we proposed the following objectives for a toolkit for Serene Textile Experiences:

- The toolkit should support designers in understanding, familiarizing, and expressing the complex and nuanced emotion of serenity, by offering scenarios to recall felt experience and articulating a rich vocabulary.
- The toolkit should facilitate the comprehension of this design space and its opportunities, by providing example application, analysis and mapping canvases.
- The toolkit should inspire and support designers in physically translating an abstract emotion such as serenity into design outcomes, and facilitate concept design to externalize acquired knowledge.
- The toolkit should provide a structure, yet be modular, flexible, and adaptable enough to be used in different design situations, balancing systematic and open design thinking.

- It should allow self-report of observation, data collection and analysis to support design iterations.

3.2 Initial version of the toolkit

Utilizing these objectives, we designed an initial version of the toolkit consisting of card decks, maps, and canvases. These enabled the testing of scenarios, vocabulary, and analysis tools for a comprehensive understanding of how to design for serene textile experiences. The initial toolkit was structured as follows:

1. **Serene Experience Canvas** (Fig. 3.1): a canvas for scenario generation based on personal experiences, emphasizing physical sensations and mood related to serene.
2. **Serene Textile Examples Card Deck** (Fig. 3.2): a deck presenting textile-based product examples designed for serenity.
3. **Form-Material-Temporality Map** (Fig. 3.3): a canvas to analyze and map examples based on different design strategies concerning form, material, and temporality.
4. **Serene Qualities Card Deck** (Fig. 3.4): a deck providing a vocabulary to describe serene experiences with qualities related to four experiential levels of materials (i.e., sensorial, interpretive, affective, and performative).

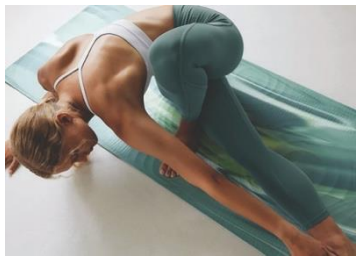
Figure 3 First version of the Design for Serene Textile Experience toolkit: (1) Serene Experience Canvas; (2) Serene Textile Examples Cards Deck; (3) Form-Material-Temporality Map; (4) Serene Quality Cards Deck.

The toolkit components were developed based on the initial findings from a literature and practice review on serene textile experiences in design. Thirty-five examples of textile-based products intentionally designed for serenity or associated keywords (e.g., calm, tranquility, stress relief) were collected, analyzed, and formalized into a 'Serene Textile Examples Cards Deck' (Fig. 3.2). To collect these products, we screened through various design sources, including books, conference proceedings and scientific journals, design blogs, fairs and exhibitions catalogs, and designers, companies, and research labs' websites.

Content analysis of the descriptions of these products revealed twenty-one clusters of qualities contributing to serenity (e.g., 'soft and smooth' and 'loose and drapey'), formalized into a 'Serene Qualities Card Deck' (Fig. 3.2). These qualities were clustered under three main dimensions: material, form, and temporality (see Table 1 for further explanation of these dimensions).

We used these three dimensions to further analyze, and map examples based on their dominant qualities, providing insights into commonly used approaches to facilitate serenity. We used these dimensions to create the 'Form-Material-Temporality Map' (Fig. 3.3).

Table 1 Three dimensions of Serene Textile Experiences

Dimension	Description	Example	Visual
Material	Serenity is achieved through the material qualities of the textile product, for example, texture, color, weight.	Align series with Nulu Fabric: Designed for yoga, it is designed to be nearly weightless, 'buttery-soft', and breathable (Lululemon, n.d.).	
Form	Serenity is achieved through the form qualities of the textile object, for example, cocooning form and enveloping features.	Vollebak's Relaxation hoodie: a fully enclosed hooded jacket, with asymmetrical sling-like pockets for isolation and relaxation (Uncrate, n.d.).	
Temporality	Serenity is achieved through a change of material or form qualities of the textile object, for example, vibration, sound, light, and temperature.	Issho: a touch-sensitive garment that records physical interactions like hugs and replicates a gentle caress using vibration (Van Dongen & Toussaint, 2019).	

Additionally, we developed a canvas to facilitate scenario generation (Price et al., 2022) by prompting designers to recall personal experiences associated with serenity (Fig. 3.1), by using 'autobiographical recall' technique expressed by writing passages and sketching about that experience (Fakhrhosseini & Jeon, 2017) as in (Xue, Zheng, et al., 2023). These scenarios served as both a means to reflect on the felt experiences for a nuanced understanding of serenity and as inspiration for design ideation. To facilitate this process in a workshop setting, we provided an initial sensitizing activity with a script and provided external stimuli (sound and scent) to increase body awareness inspired by related works in design (Höök et al., 2015; Lewis & Stasiulyte, 2022; Fakhrhosseini & Jeon, 2017) and by traditional relaxation techniques (Feldenkrais, 2011; Brennan, 1998).

For the ideation activity, we developed a brief prompting to 'design a textile(-like) object that would induce serenity for an individual, group, or transitional context.' Next to these, the toolkit includes blank A3 canvases for ideation, and a collection of inspirational textile forms. All of these will be elaborated in section 4.

3.3 Participatory workshops

To explore the use of the toolkit and develop it further, we facilitated two rounds of participatory workshops with design professionals from academia and industry. Participatory workshops are adopted as a qualitative research method that allows for exploration of relevant factors not immediately evident to researchers through collaborative discussions and feedback (Mosely et al., 2021; Tsekleves, 2020). We set up the workshop following the guidelines related to participatory workshops (e.g., Chambers, 2002; McDonald & Headlam, 2015; Brodersen Hansen et al., 2019). The workshops aimed to assess the overall approach of the toolkit, its specific tools, and the benefits and limitations for prospective users.

In the first Workshop, we explored the initial version of the toolkit with four design researchers experienced in materials experience design. Based on the findings (see sub-section 3.4.1), we redesigned the toolkit and adapted the procedure for the second version. We used the second version of the toolkit in the second Workshop, where we invited ten participants with expertise in materials, product, and textile design from both academia (n.3) and industry (n.7), i.e., lululemon athletica, specialized in activewear and yoga gear. This application context is particularly promising for the affinity with physical and psychological wellbeing, providing opportunities to explore the relationship between textile and serenity while avoiding access barriers posed by ethics in healthcare and competitive sports.

3.3.1 Procedure

The two workshops consisted of a 3-hour series of mixed team-work activities aimed at testing the toolkit in a protocol inspired by the traditional design process, with diverging activities to understand the context and converging synthesis activities to generate ideas (Fig. 4). Participants were provided with components of the design toolkit to drive the different design phases, as outlined in Table 2.

Table 2 Workshop procedure

Activity	Time	Participants arrangement	Description	Tools
1. Introduction	20’	Plenary	Presentation of workshop agenda, goals, and approach to introduce the workshop's purpose and content.	
2. Sensitizing	10’	Individual	A guided body-scan exercise is used to enhance participants' relaxation and sensory awareness.	Script, scent, sound.
3. Recalling	20’	Individual	Stimulated by the previous exercise, participants are prompted to share a personal serene experience.	Serene Experience Canvas
4. Detailing	25’	Groups of two/three	Participants describe their serene experiences using a set of identified qualities or add new qualities, followed by sharing the outcomes with the group.	Serene Qualities Card Deck
5. Mapping	30’	Groups of two/three or combined groups of four	Each group maps given examples according to three variables (form, material, and temporality) and discusses their choices and motivations.	Serene Textile Examples card deck; Form-Material-Temporality Map
6. Ideating	30’	Groups of two/three	Participants generate design ideas using tools and insights from earlier activities. They are prompted to revive their own serene experience through a design solution. They present their ideas after drawing and describing them on paper.	Brief text, previous tools, next to white canvas and textile samples.
7. Conclusion	15’	Plenary	Participants share feedback and takeaways.	

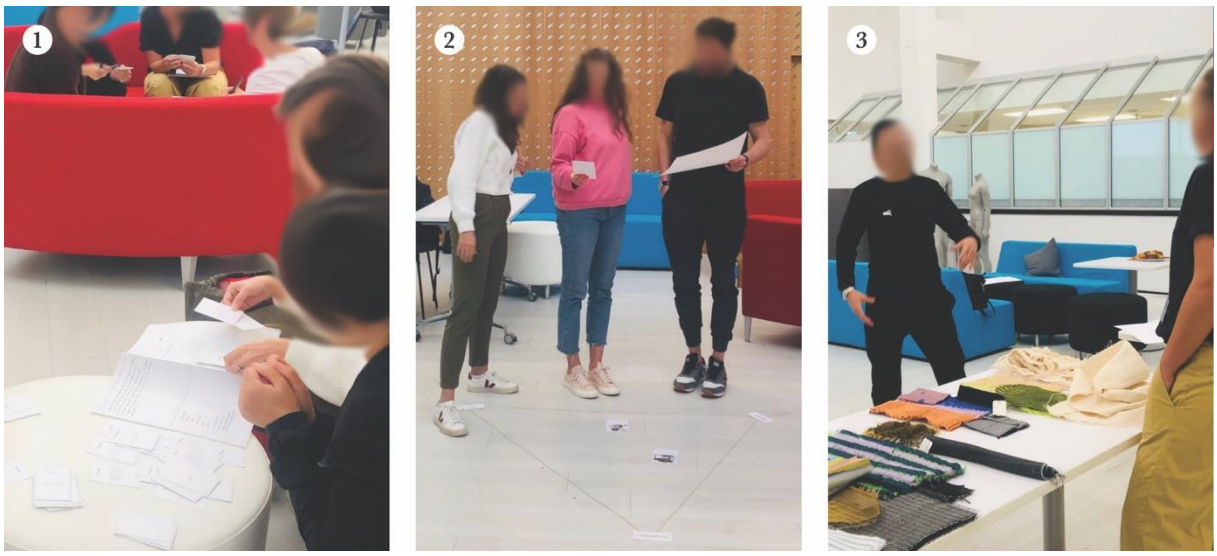


Figure 4 Images of workshop activities: (1) Participants detail their recalled serene experience placing the Serene Textile Qualities cards on the Serene Experience Canvas; (2) Participants analyze and discuss provided examples placing the Serene Textile Example cards on the Form-Material-Temporality map; (3) Participants engage in the ideation of concept ideas using provided textile forms as inspirations.

3.3.2 Data collection and analysis

During the workshop, we employed various data collection methods including observation of activities, direct questioning of participants for contextual feedback, and analysis of the workshop results such as the filled-in canvases and cards. Participants' notes, sketches, and opinions were recorded on these materials (Fig. 5). Pictures were taken when necessary to document specific results, and one facilitator transcribed participant comments. The collected data were analyzed in the days following the workshops combining In Vivo coding and focused coding, and a follow-up meeting was held between facilitators and selected participants to discuss the analysis.

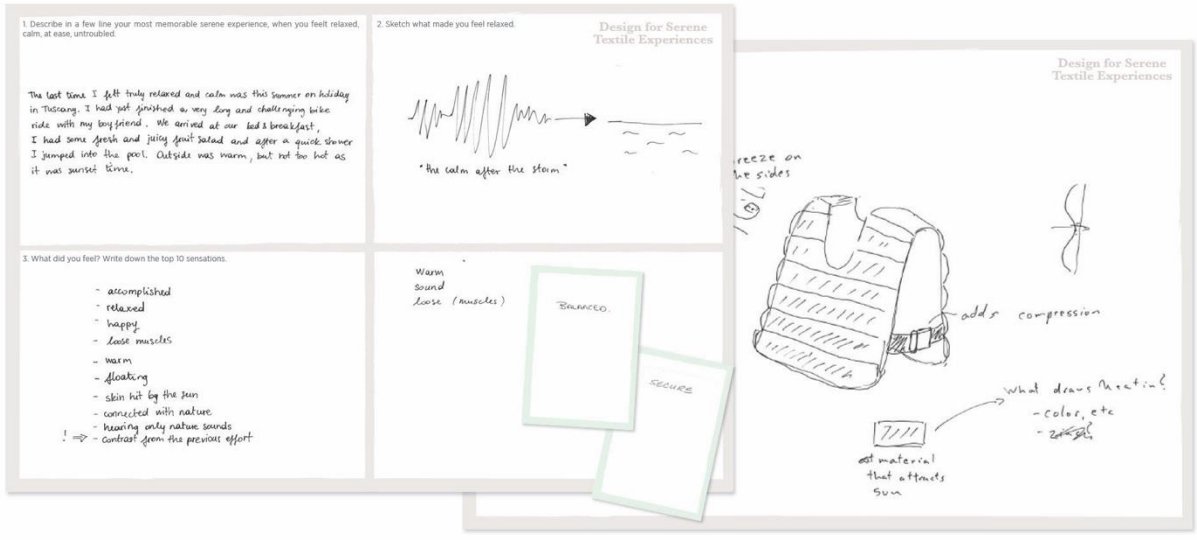


Figure 5 Image of canvases and cards filled in with participants' notes and sketches.

3.4 Workshops' findings and two rounds of toolkit iterations

The toolkit was tested in two rounds of participatory workshops as described in section 3.3 and was updated after each round, based on observation and results analysis.

3.4.1 First iteration

Following the first workshop, in the Serene Textile Examples Card Deck, we removed redundant cases and aimed to cover a diverse range of industrial fields and product categories. As a result, the number of cards was reduced from thirty-five to twenty-four. To map the examples, initially we designed a A3 board containing a map in the form of three circles intersecting in the middle, each representing one dimension (Form-Material-Temporality Map version 1, Fig 3.3), and intersecting areas representing their overlaps. Because in the first workshop it became evident that very rarely examples belong to only one distinctive dimension, we decided to use a map in the form of a triangle (Fig. 8). We used this updated version of the toolkit in the second Workshop. Below we summarize the aggregated findings from the two workshops, informing a second iteration of the toolkit following the second workshop.

3.4.2 Second iteration

Throughout the activities of the workshops, participants provided rich and nuanced accounts of their personal experiences associated with serenity, both by recalling and detailing the lived experience and in reviving it through the design concept. These accounts revealed several key themes contributing to the expanding the qualities for serene experiences in various contexts.

Fine-tuned sensory qualities for bodily and cognitive comfort. Participants share vivid sensory descriptions of serene experiences, often mediated through the sense of touch, smell and sound, evidencing the sensory connotation of serenity. These include bodily sensations such as the breeze gently touching their face, the warmth of the sun on their skin, or the body sinking on the couch. These sensations were often described as finely tuned and balanced to provide sensory comfort, avoiding overwhelming or euphoric intensity. For example, the presence of the "sound of nature, but relative silence" (P6) and "Outside it was warm, but not too hot" (P3). Participants described serene experiences through the engagement of embodied performances and actions, like planting, flower-picking, and barefoot walking. Importantly, serenity was consistently described as the absence of either physical or cognitive tension, for example manifested in a "loose and limber body" (P10) or "reading a book with no time constraints" (P6). A concept idea developed by the participants echoing with this theme was a vest designed to enhance bodily comfort with compression, air flow circulation, and temperature regulation (P3 and P8).

Contextual descriptors in relation to familiarity and control. These serene experiences are commonly situated within specific contexts, such as being in nature, during holidays, while gardening, lounging on the beach, or relaxing on a patio, rather than in the interaction with artifacts. Notably, participants frequently associated serenity with familiar elements of daily

life, which may be associated with a sense of safety and control, such as the "smell of making breakfast on Sunday morning" (P8). Elements of nature, including the sound of waves and the fresh scent of grass and sea, were also integral to their serenity experiences. The presence of elements participants recalled hearing happening peripherally, such as the sound of P9's "kids laughing and playing", emerges as a recurring theme of interest. It describes a profound sense of connectedness to the present moment, while simultaneously keeping worries at bay and retaining a sense of control. On a similar line, a participant expressed serenity as feeling safe and relaxed in their home environment, despite external adverse factors, i.e., a storm. A concept idea aligning with this theme was a self-cleaning shirt incorporating a body-detergent material technology, encouraging the users to "be themselves", in control, and free of worries when doing sport (P4 and P5).

Temporal descriptors in relation to release and reward. Another recurring theme is associating serenity to the aftermath of challenging events, such as strenuous physical activities or a work deadline. Serenity is enhanced through the contrast from previous efforts and the release of burdens. For example, after "a very long and challenging bike ride" (P3), defining that feeling as "the calm after the storm" (P3) or "a catharsis" (P10). Conversely, some participants discussed that serenity rather than a short-lived and intense emotion in response to the interaction with an object is a subtle and long-lasting affective state or mood influenced by a stratification of events. Upon analyzing the concepts, an example resonating with this theme was a bodysuit shifting from tight fit during performance to loose fit during recovery through the use of sensors and actuators (P1 and P10).

While most of the tools underwent updates after the first workshop as described above, after the second workshop, we refined the quality cards. We extended them from twenty-one to forty-five cards, expanding the vocabulary to qualities coming from the participants' personal serene experiences, mostly related to interpretive and affective level of experience such as, 'effortless, sinking, limber, safe, balanced, and connected'. Moreover, triggered by the workshops, a follow-up discussion with a narrowed number of the industy participants followed, aimed at discussing the findings and deploying them into concrete design approaches. The outcomes of this discussion are detailed in section 5.

4. A toolkit to design for serene textile experiences

Based on the insights obtained from the workshops, we updated the toolkit. The final version, though still an organic design tool open to further development, is presented below. For further details, see supplementary materials.

4.1 Serene experience canvas

Serene Experience Canvas (Fig. 5) facilitates recalling (Activity 3. Recalling) and detailing a personal serene experience (Activity 4. Detailing). It is divided into four quadrants, each for a specific task. This activity aims at guiding designers in recalling personal experiences associated with serenity, facilitating the generation of contextually related emotional scenarios.

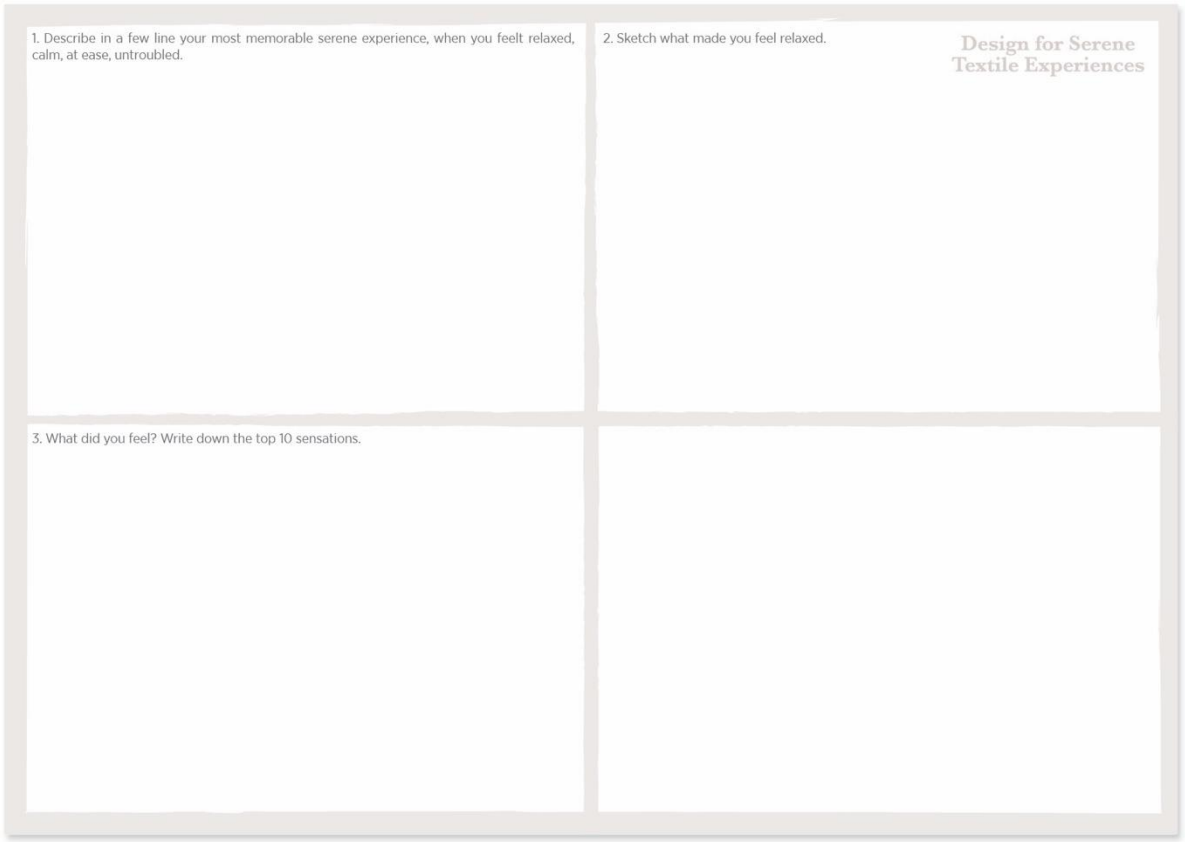


Figure 5 Serene Experience Canvas

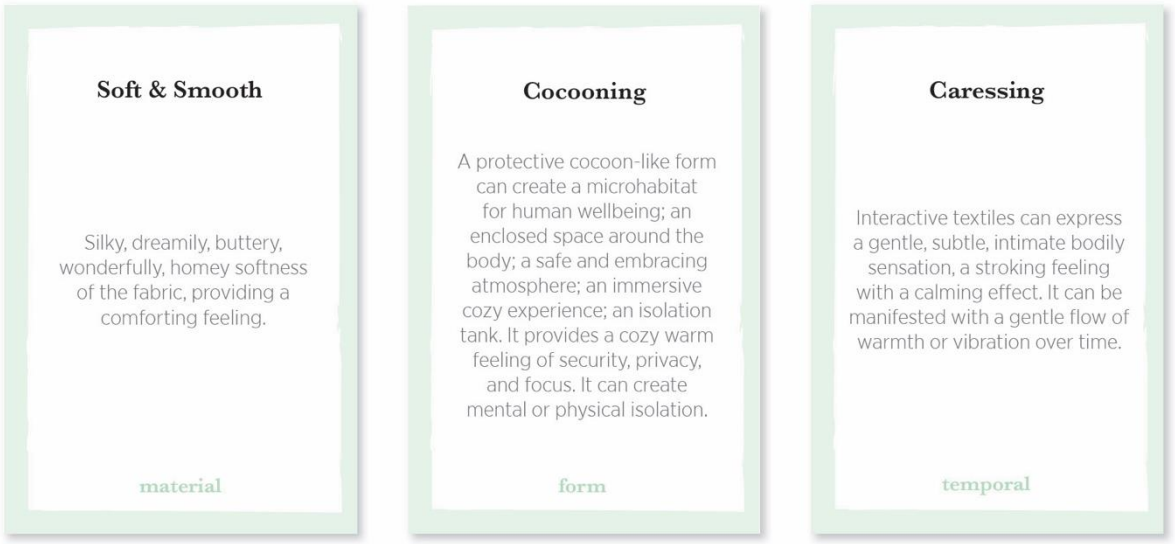


Figure 6 Three cards from the Serene Qualities Card Deck

4.2 Serene qualities card deck

A deck of forty-five cards contains textual description of qualities characterizing textile objects for serene experiences (Fig. 6). Each card contains a quality or two (if two qualities are often used as a pair in the description of serene textile objects, such as soft and smooth) and

a short description of the quality. This deck aims at providing designers with a vocabulary to describe and discuss material, form and temporal qualities related to serenity. Designers can use this deck to label and detail their own serene experience (Activity 4. Detailing). Additional blank cards are also provided as part of the deck to add any qualities designers identify that are missing.

4.3 Serene textile examples card deck

A deck of twenty-four cards contains examples of textile(-like) objects designed for serene experiences (Fig. 7). Each card describes the textile-based object, with a picture and textual information, i.e., name of the project, the name of the designer, a short text describing what the object is, how it works, with an emphasis on the materials, form, and temporal qualities brought to the fore in the design. The card deck assists designers to reflect on textile qualities enhancing serenity (Activity 5. Mapping), and as a source of inspiration for designing new ideas (Activity 6. Ideating).

Figure 7 Three cards from the Serene Textile Examples Card Deck

4.3 Form-Material-Temporality map

The map, in the form of a triangle (Fig. 8), presents the three dimensions of serene textile experiences in textile-based objects—material, form, temporality—with each corner representing one dimension and its description. The map aims to help designers to position and critically analyze examples according to the design strategies related to these three dimensions.

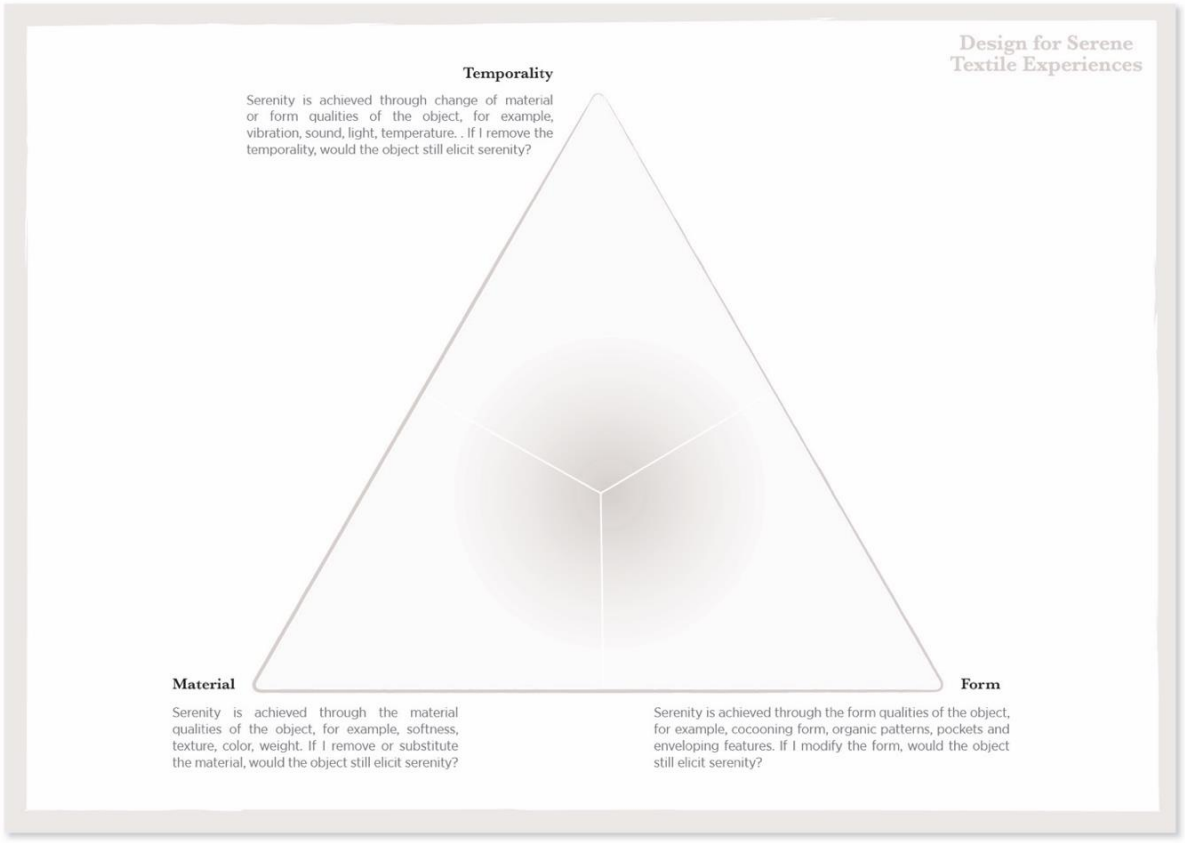


Figure 8 Form-Material-Temporality map

4.5 Textile samples

In our toolkit, we included textile samples (Fig. 9) developed within our research lab as inspirational tools in the ideation phase (Activity 6. Ideating). The selected samples present diverse form, material and temporal qualities enabling interactivity through the workshop.

Figure 9 Textile samples, courtesy of Milou Voorwinden (TU Delft).

5. Discussion

In this paper, we present a toolkit developed to support designers in understanding and designing for serene experiences with textiles. Our intention is not to establish or enforce a one-to-one relationship with certain qualities and serene material experiences. Instead, we offer a set of tools to navigate the rich design space of textile experiences, and inspire novel relations leveraging material, form, and temporal qualities of textiles.

In the two consecutive workshops we conducted, designers emphasized the value of the toolkit for acquiring a vocabulary to comprehend and convey a complex emotion—such as serenity—and for helping them to translate their understanding into design ideas. The toolkit inspired them to think beyond single dimensions in the design for serene textile experiences (e.g., form only) toward qualities tuned at different material and time scales. In this sense, the toolkit can support design processes where the material is a departure point (Karana et al., 2015), by expanding Experiential Characterization of Materials (Camere & Karana, 2018) to include form and temporal qualities. The success of the toolkit can be gauged by participants' capacity not only to understand and express serenity, but to reflect on the experience and generate concepts, scenarios, and design approaches.

From the analysis of the results and related discussion, three design approaches for textile applications emerge, each with a unique focus on creating serenity in different ways and timeframes.

Design for the here and now. This approach is centered around fostering a connection with the present moment and oneself. This potential unfolds in precise instances and relies on fine-tuned sensory stimulation based on the harmonious coexistence of opposing qualities within the textile, e.g., the combination of fit and loose qualities, or warm and cool. This can be achieved by engineering textiles presenting such contrasting qualities in specific areas of the body.

Design for Catharsis. This approach aims to enhance relaxation and contentment, invoking feelings of reward and release within a brief timeframe. This approach thrives on transitions from one quality to its opposite, like the shift from a fit to lose feeling, or from lightness to heaviness. This can be obtained using materials that are able to change reversibly, e.g., animated textiles (Buso et al., 2022), and align with the principles of Designing with Tension-and-Release (Winters et al., 2022).

Design for Accumulation of Traces. This approach unfolds over a more extended temporal horizon, spanning weeks or months. Here, the focus is on the gradual accumulation of material traces over time, reflecting the user's progress and growth. The purpose is to imbue the user with a profound sense of accomplishment and to create positive memory markers that underscore how far they have come in their physical and spiritual journey. This approach relies on materials that change permanently over time, aligning with the principles of slow design (Grosse-Hering et al., 2013), leaving behind tangible traces (Robbins et al., 2016) of the user's transformative experience.

These three approaches illustrate that incorporating temporal dimension is a pivotal step forward in enhancing the effectiveness of our toolkit. For example, it allows exploration of various temporal scales, speed, rhythm, culminating into diversified concept ideas and insights. It encourages us to consider multiple timeframes in the design project for serenity, from the immediate to the long-term, when employing our methodology. In practical terms, as we further utilize our toolkit in subsequent workshops, we can implement these temporal approaches as integral components of the toolkit, particularly during the ideation phase. In the context of this ongoing research project, we would use these design approaches to inspire application concepts through iterative ideation, materials exploration, and prototyping. While these design approaches suggest pathways to mobilize serenity, the 'serene quality cards' represent access points and landmarks to orientate and inspire in the selection of materials (e.g., soft and plush yarns with subtle colors), forms (e.g., enveloping forms with a loose fit), and temporal expressions (e.g., slow and repeated flowing). This experience provides a particular case of how these tools can be employed by design researchers in collaborative projects to ideate and fabricate for serenity in textile context.

The toolkit was intentionally designed to be modular and flexible, allowing for its adoption in various situations and activities–encompassing reflection, ideation, and evaluation. The components of the toolkit can be deployed in education contexts, e.g. in design studios or graduation projects, in practice contexts, e.g., clothing and textile design professionals and firms, and in participatory contexts, e.g., co-design sessions. In such contexts, the components can support diverse stakeholder to familiarize with a vocabulary that prioritize material experiential qualities over technical characteristics. By utilizing the provided vocabulary ('Serene Textile Example Cards') and recalling exercises ('Serene Experience Canvas'), we expect users to improve understanding and articulation of serenity, while getting familiar with its rich granularity as an emotion. The toolkit offers the opportunity to practically translate this abstract and complex emotion into creative and nuanced design outcomes. The 'Serene Textile Example cards', 'Serene Quality cards', and 'Form-Material-Temporality Map' can support in comprehending the serene design space and its opportunities. At the same time, they support in the development of a critical lens in analyzing the existing artifacts designed for serenity, such as wearable pervasive technologies for stress and anxiety regulation. This, in return, helps designers in refining their own concepts. We aim to explore these diverse ways the toolkit can support the design process in future studies conducted in real-life scenarios.

The toolkit is inherently organic and open to further development. Through practice and literature review, one could incorporate recent examples and potentially identify related qualities that enrich our toolkit's accuracy. Our first iterations are based on the toolkit application in a particular industrial context, i.e., activewear. However, by conducting workshops with participants with diverse experiences and backgrounds, e.g., healthcare, transportation, and interior design, we can uncover novel qualitative descriptors for serene experiences and generalize the toolkit. Although the purpose of the provided vocabulary is mainly inspirational, it can be further developed into an operational one to select certain fibers, tech-

niques, and construction in textile design and production. With this generative and participatory approach, these new findings can contribute to the toolkit's ongoing evolution, ensuring that it remains a dynamic and updated resource capable of accommodating diverse needs, contexts, and creative process. Future iterations of the toolkit could incorporate additional methods and techniques, such as body maps (Cochrane et al., 2022) and trajectories (Tennent et al., 2021). Furthermore, the reflection on embodied experience (Höök, 2018) may reincorporate body and movement into design for wellbeing. The integration of tools from Design for Emotions (Desmet, 2002) could improve emotional granularity (Yoon, et al. 2013). The methodology used in designing the tool and the design protocol applied in its utilization has the potential to be extended to design for other textile experiences beyond serenity, such as 'awe' (Ke & Yoon, 2020) or 'playfulness' (Lucero & Arrasvuori, 2013).

6. Conclusion

This paper outlines the development of a toolkit to facilitate the design for serene textile experiences, including four main tools: (1) Serene Experience Canvas; (2) Serene Textile Examples Card Deck; (3) Form-Material-Temporality Map; (4) Serene Qualities Card Deck. The toolkit was developed through a review of relevant literature and practice, and through two participatory workshops involving design professionals. While open to further development, the toolkit has proven to be a valuable asset in providing a vocabulary and inspiring a rich design space in designing for serene textile experiences.

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