Somaesthetic Appreciation Design

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ABSTRACT

We propose a strong concept we name Somaesthetic Appreciation based on three different enquiries. First, our own autobiographical design enquiry, using Feldenkrais as a resource in our design process, bringing out the *Soma Carpet* and *Breathing Light* applications. Second, through bringing in others to experience our systems, engaging with and qualitatively analysing their experiences of our applications. In our third enquiry, we try to pin down what characterises and sets Somaesthetic Appreciation designs apart through comparing with and analysing others' design inquiries as well as grounding them in the somaesthetic theories. We propose that the Somaesthetic Appreciation designs share a *subtleness* in how they encourage and spur bodily inquiry in their choice of interaction modalities, they require an *intimate correspondence* – feedback and interactions that follow the rhythm of the body, they entail a distinct manner of *making space* shutting out the outside world – metaphorically and literally – to allow users to turn their attention inwards, and they rely on *articulation* of bodily experiences to encourage learning and increased somatic awareness.

Author Keywords
Somaesthetic design; body awareness; strong concept

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

INTRODUCTION
The somaesthetics theory explores somatic practices and demonstrates how they can lead to the attainment of fulfilling experiences [45]. As such, it is a promising theoretical foundation for design of technologies on or around the body. Especially as a route to achieve aesthetics and users experiences rhyming with and allowing us to become more sensitive to and even extend on the pleasures and displeasures, beats, rhythms, and richness's of the living body – our human condition. But how do we translate from theory to

design, what are the strong concepts that can generate somaesthetically inspired design? We propose *Somaesthetic Appreciation* as one of the strong concepts that can help serve a generative role, opening a design space with many different applications – applications where the interaction subtly supports users' attention inwards, towards their own body, enriching their sensitivity to, enjoyment and appreciation of their own somatics [17].

BACKGROUND
Movement is the basis, premise and start for our way of being in the world [44]. It is only when the newborn baby moves or when there is movement in the environment that the world becomes accessible and perceivable – as our perception is geared towards movement, to the extent that we cannot even see that which is not moving [ibid]. Our senses are active, not passively receiving stimuli from the environment [32]. We are in the world, acting in the social and physical environment with our bodies – not separate from it.

In the words of Shusterman, our bodies are "*our indispensable tool of tools, the necessary medium of our being, perception, action and self-presentation*" [46]. Our bodies hold sway of our thoughts and feelings [44], placing them in their physical, social and temporal space where it shapes and guides everything we experience [32,45].

The idea of embodied interaction [4], has had a huge influence on HCI showing us that "*you cannot separate the individual from the world in which that individual lives and acts*" (p. 18) and therefore requiring that the artefacts we design must be seen as part of the whole life world of people. But in the writings about embodied interaction, the actual, corporeal body—our muscles, the way we move, our postures—has been notably absent from most of the discussion with only a few exceptions [12]. Those who have attempted to understand and design with an embodied interaction perspective that also incorporates the living body have had to look further than to the phenomenological theories introduced by Dourish.

Let us start by providing a brief introduction to somaesthetic theory and in particular Shusterman's focus on somaesthetic appreciation practices and Feldenkrais' bodywork method before discussing our method for translating from these theories into design.

Somaesthetic theory
Somaesthetics is an interdisciplinary field, originally proposed by the philosopher Richard Shusterman and ground-

ed in pragmatist philosophy and phenomenology. By putting together the two words *soma*, the body, with *aesthetics*, our sensory appreciations, he draws our attention to the importance of our bodily movements as part of our ways of being and thinking. In the book *Body Consciousness*, Shusterman goes back over the centuries of philosophy all the way back to the Greek philosophers, noting that in their work, the body was never separated from the mind. Educating yourself as a philosopher entailed engaging both with bodily practices and with reasoning – they were never separated. But in the Western philosophies we later came to separate mind and body [3]. This is where the term embodiment later came to take a strong role, but as pointed out by Sheets-Johnstone, the introduction of embodiment is a mere "*lexical band-aid*" to remedy a problem that is a fundamental misunderstanding of the human condition. As there is never any possibility for us to be disembodied, adding the concept embodied to any human activity, as in e.g. 'embodied mind' [24], 'embodied agents', does not make sense. It is in our animate forms that life begins, this is where emotions are rooted, where concepts and language begins – not is something might be terms 'mental life' according to Sheets-Johnstone [ibid].

But with somaesthetics, Shusterman takes this understanding one step further. Not only are movements and the living body the lens through which we can understand the world, this "*tool of tools*" is also mouldable. By learning, improving and playfully engaging with movements involving our muscles, nervous system, and senses, we extend on our experiences and create for better ways of being in the world. Learning body awareness and better use our bodies is as important as educating our minds. This applies both to the motor system, such as when learning to ride a bike, and to the sensory system, learning to interpret and make sense of our bodily experiences. Thus, by increasing our body awareness through engaging in various forms of training, we can become more perceptive and aware in the physical world in which we live and act. Through such training, we may enjoy novel playful, engaging, pleasurable experiences, as well as painful ones. As framed by Juhan [22]:

"*Not only is it true that the nervous system stimulates the body to move in specific ways as a result of specific sensations; it is also the case that all movements flood the nervous system with sensations regarding the structures and functions of the body, and sensations are the substance of that bond.*"

To improve our somaesthetic appreciation or body awareness, we need to move and furthermore move in ways that shifts us out of our habitual movements and response patterns. We rarely question our everyday way of walking, breathing, standing, or attempt to break with our movement patterns. While moving in our habitual ways allows us to go about our daily tasks with a minimum of effort, they also prevent some experiences, some ways of being in the world. A limited repertoire of movement becomes a limited repertory of experiences. This becomes painfully obvious to us when we try to change our movements, as when, doing sports in a different manner or learning a new posture for horseback riding [14]. As described by Khut [23]:

"*Somatic bodywork methods involve a momentary surrender of these response patterns, during which time the bodyworker introduces a flood of unfamiliar sensations and movements to stimulate new or long forgotten sensorimotor experiences designed to provide the client with a more up-to date sense of themselves and how they can be in a given situation (i.e. work, sport, home, dance, etc.).*"

Shusterman proposes that a somaesthetic agenda by necessity also comprises a practical strand, to engage in somaesthetic relies on and requires engaging in actual somatic bodywork. There are many different bodywork methods we can engage in to improve our somaesthetic appreciation, such as yoga, meditation, Feldenkrais, or Alexander-technique. In the design work presented below, we engaged in Feldenkrais-exercises.

In short, Moshe Feldenkrais sought ways of extending our ways of being in the world through reminding us of the many different ways any habitual movement can be done [5]. If we have pains or difficulties in engaging in certain movement patterns, there will be several alternative ways of performing the same movement. As a simple example, to stop breathing, you can contract the muscles of your throat, you can contract or expand your diaphragm, you can close your lips, you can push your tongue up to the roof of your mouth and so on. All of these we "know", but we are not aware of them and we might only be using one of them as it has become habitual to us. In Feldenkrais-lessons we perform these movements extremely slowly, sending signals back through the nervous system that can be decoded and extend on our repertory of movements. A typical Feldenkrais-lesson will take an hour.

"*If a man [sic] does not feel he cannot sense differences, and of course he will not be able to distinguish between one action and another. Without this ability to differentiate there can be no learning, and certainly no increase in the ability to learn.*" (Feldenkrais, 1990)

METHOD
Given the proliferation of various wearable technologies and health applications the HCI-field needs new directions for how to design in harmony with our bodies. But how do you translate from theories such as somaesthetics into practical design work? The method we use to explore this design space can be broadly categorized as Research through Design (Rtd) [55,16]. In an RtD research process, design work in the applications domains will drive the exploration of both problem and solutions – that is, we gain new knowledge via the act of making. The knowledge gained through such a process can be expressed and articulated in many different forms, sometimes referred to as *intermediary knowledge* forms, such as annotated portfolios [2],

experiential qualities [49], strong concepts [16], design methods or design principles. Here, we propose a strong concept, Somaesthetic Appreciation, as the outcome of our practical design process and analysis. Höök and Löwgren [16] describe strong concepts as:

- It concerns the *dynamic gestalt* of an interaction design, that is, its interactive behaviour rather than its static appearance.
- It resides at the interface between technology and people. It is a design element, a potential part of an artefact, and at the same time, it speaks of a use practice and behaviour unfolding over time.
- It carries a core design idea which has the potential to cut across particular use situations and perhaps even application domains.
- It resides on an abstraction level above particular instances, which means that it can be realized in many different ways when it comes to interface detailing (cf. concept design vs. detailed design).

An important property of a strong concept is that it should be *generative*. That is, it should be helpful in creating alternatives in the explorative phase of a design project. It needs to serve as one possible way of addressing a design challenge in the repertory library of a designer [43] alongside all the other possible interactions, experiences, design exemplars and ideas the designer knows of. The litmus test of whether a concept is generative or not, is notoriously hard to pinpoint [16]. It needs to support investigations of "*what may be rather than simply what is*" [48]. A naive approach to testing the generative strength of a concept is to imagine a design situation and ask yourself: "given this design challenge at hand, will [strong concept] spur any relevant design ideas?"

Identifying and validating a strong concept

Höök and Löwgren propose four steps to how we can identify and validate a strong concept in an academic sense. First, the concept is identified – which can be from many different sources: theory, empirical investigations, analysis of designed systems. Second, we engage in horizontal grounding, that is, a comparison to what other academics have already identified as strong concepts helping to determine whether we have discovered something new or already known to the community. Third, through building design exemplars or analysing already existing design, we instantiates and fill the strong concept with content, while simultaneously providing an empirical basis for the claim that the concept can generate more than one application. Vertical grounding also entails anchoring the concept in theories explaining *why* it works – how and why users might engage in the interaction. The final fourth step in constructing a strong concept involves validating whether it is *contestable, defensible,* and *substantive*. It brings together all the work in the prior three steps, showing that the concept is novel (contestable) to our community, whether and how it is grounded vertically and horizontally (defensible),

and whether it is relevant to and can serve a generative role in design practice (substantive).

Design process

Our RtD-method employed the following specific design methods.

Brainstorming through/after Feldenkrais exercises: In this particular project, we engaged in Feldenkrais-lessons once a week for almost two years. Our design ideas grew out of these sessions and were also tested in them, by ourselves. In order to properly learn a somatic practice like Feldenkrais and to train your (soma-)aesthetic sensitivities as a designer, it is important to be led someone knowledgeable—or, in the words of Schiphorst: a somatic connoisseur [40]. In our work, we started with a two-day workshop led by Richard Shusterman, who is a trained Feldenkrais practitioner. This two-day workshop helped us to not only get a feel for the bodily practice but also to get some of the theoretical considerations and questions framed in their proper context. After this kick-off, our weekly exercises were led by another trained Feldenkrais-practitioner, Kristina Strohmayer. It was important to our design decisions to be reminded of what body awareness experiences we were seeking which is why we tried to make important design decisions right after those Feldenkrais exercises.

An interesting result of engaging in Feldenkrais exercises was the effect on our whole beings. After a lesson, we all felt we had become more honest, more grounded in ourselves, more reflective, and a bit slower in our movements and reactions. Right after engaging in one of the lessons, we could not immediately shift into doing design work (or any other activity). We needed to first slowly rise from the exercise, talk about it with one another, and then take a break before coming back to the work tasks of the day.

We would like to point out that Feldenkrais is but one of the possible bodily practices we could have engaged in and our design explorations should not be seen as tools only related to this particular body method. Other designers have engaged in other bodily practices to ground their design: move to be moved [12], palpable experiences of touch [39], biofeedback loops [23], and even horseback riding [14], to name a few.

Material encounters: During the design phase, we tried to always start with a Feldenkrais exercise, after which we touched, felt, interacted with the materials [40] that could make up a supportive design for the experience we, step by step, identified. We will provide some more insight into two of our chosen materials (heat and pulsating light) below. Also turn to Jonsson et al. [21] for a full account of the aesthetics of heat.

When bringing out the two designs presented below, we repeatedly had to try different digital and physical materials, faking interactions with manually controlled sensory stimuli, and testing them in situ to find the ones that would make sense. The interactions had to be simulated and acted

out in order for us to really feel their impact on our bodily experiences. Simply imagining what they would be like was not enough to qualify the experience. Or as expressed by Löwgren and Stolterman, we had to access the *dynamic gestalt* of the interaction [30].

Autobiographical design: Our design work is best described as an autobiographical design enquiry [34]. In an autobiographical design enquiry you use yourself, your own experience and desires as key in developing the design. That is, we took on all the roles in the design: we were designers, researchers and users of our own design concepts as they evolved.

Involving others: In the second phase of the project, participants were invited to try our prototypes. The first session with 7 participants lead to a range of refinements of our prototypes. In a second session, 22 participants engaged in a similar one-hour experience, expressing their bodily experiences before and after the session with our prototype on *body sheets* – a method we will explain below.

DESIGN EXEMPLARS: SOMA CARPET & BREATHING LIGHT

Several different prototypes and design concepts arose throughout our design process. Here we focus on two of them that we have implemented and tested fully: Soma Carpet and Breathing Light.

The Soma Carpet—Directing attention with heat

We often take for granted that we have immediate access to our perception and experience of and through our bodies. But inward listening is a demanding activity and thus not easy to design for. With the Soma Carpet (Fig 1) we wanted to support the ability to direct your attention by providing heat feedback to different parts of your body while you followed the instructions of a pre-recorded Feldenkrais lesson. When the instructor says, for example, *"How does your body contact the floor right now—your heel, your right heel? Left heel? Is there any difference between how they contact the floor?"* the mat heats up underneath your right heel and then your left heel. The warmth comes on slowly and leaves slowly [20].

Figure 1. The Soma Carpet and Breathing Light prototypes

Breathing Light—An enclosed space for reflection.

An important part of the somaesthetic philosophy is the notion that in order to achieve a better understanding of your body, you have to actively interfere with your daily unconscious routines and create room for reflection. The Breathing Light prototype consists of an enclosure made of fabric and string curtains (Fig 2) that you crawl under, creating a room within a room, effectively shutting out the external world. Inside this enclosure we have placed a breathing sensor that measures the movements of your chest. The sensor controls a lamp inside the module, creating an ambient light that will dim in cadence with your breathing. When you lie down on the Soma Carpet with the Breathing Light module above you, you feel enclosed and taken care of. As you close your eyes, what you see through your eyelids is the dimming of the light.

Participant Encounters

Below, we will not provide a full account of our participant accounts of these systems as we aim to only discuss qualities that set Somaesthetic Appreciation designs apart from other designs. But in short, the experiences of using these two systems often lead to quite strong, mainly positive, reactions. Participants felt that they were brought into a situation where they had to face themselves, their bodily pains, feelings of stress, their busy minds, their neglect of taking care of themselves, but in a positive manner where they learnt more, became more focused, landed back in themselves, became more emphatic with their own bodies and movements. In particular the heat contributes to a very strong, emphatic, inwards-focusing experience of yourself.

It was striking to see how many of these descriptions differed from one another. Some experiences seem more easily expressed, such as pains in specific limbs and parts of the body. But beyond these spatially fixed and "ontologically clear" statements, there was a vast space of experiences that were not easily captured, expressed using words and metaphors borrowed from other lived experiences, such as using colours (blue or black), materials (rubbery), weight (light or heavy), or spatiality (elongated or compacted).

ARTICULATING THE QUALITIES OF SOMAESTHETIC APPRECIATION DESIGN

Let us isolate the key qualities central to the strong concept somaesthetic appreciation design – the qualities that set this strong concept apart from others. The qualities are formed based on the experiences from the design inquiry described above as well as from an analysis of the accounts from the participants we invited to interact with the prototypes.

I. Subtle guidance – directing attention inwards

As first lesson was that when designing for body awareness the interactions that guides and directs a person's focus and attention, for example towards specific bodily or sensory sensations, need to be very *subtle* – sometimes almost barely noticeable. A challenge became finding the balance between guiding attention but not grabbing it. As noted by e.g. Schusterman [45] the perception of bodily experiences

always happens in relation to the external world, either by moving the body or by sensory interactions with external objects. The sensation of weight of the foot can for example be perceived through the sensory experience of the contact with the floor. When designing interactive modalities that aim to guide focus and attention, the subtleness of the stimuli has a major impact on whether the focus stays on the introspective somaesthetic appreciation, or if it shifts outwards, towards the source of the stimuli and the surrounding environment.

Subtle guidance relies on the interplay between two different concepts that Schusterman has developed further from William James; *change* and *interest* [20]. By change he refers to the importance of subdividing the bodily experiences into more specific areas or functions and then engaging in activities that shifts focus from one area to another and back in order to provide a more nuanced and rich perception of fine-grained movements. The notion of interest on the other hand deals with finding means to achieve a sustained attention towards the part of the body currently attained to. Or as Schusterman phrases it:

"*To reach precise bodily introspection the key is to direct our focused attention first to one part then another, a clearer sense of relations of parts to whole can be obtained. This transition of focus, provides sense of change, it also renews our interest in each new body part*".

Thus, in the framing of somaesthetic appreciation design the notion of subtle guidance should be understood as mechanisms that both provides a changing stimuli that helps the shifting of attention between areas or functions of the body as well as providing support for attention to linger and stay focused in one movement or area, keeping the mind from wandering.

How is 'subtle guidance' manifested in the designs?
In the Breathing Light system, the pulsating light helps to keep the interest and focus on the breathing, while simultaneously reinforcing and bringing to the fore the experience of changing between inhaling and exhaling.

In the Soma Carpet, the thermal stimuli in the mat serves to systematically guide focus towards different areas of the body, as well as aiding an attained focus to each area.

Figure 2. Subtle guidance through a) warm water b) heat pads and c) light

Grounding in the design inquiry
Arriving at those particular choices of interactive modalities – heat and pulsating light – was not trivial. For example, heat was chosen after exploring many different ways to enhance and reinforce the Feldenkrais experience: by light,

visuals, ambient sound, 3D-sound, vibrations, touch, air blowing and heat. In experiential exploration workshops on sensory feedback, the project team tested a variety of sensory stimuli from inflatable mattresses to stroking the skin with brushes during parts of a Feldenkrais exercise. As a part of these explorations we also explored the modality of heat or thermal stimuli as a means of guiding attention, using for example sodium acetate 'instant heat pads' hand warmers, wheat grain based heat pads and warm water running in tubes. Here we found that there were certain qualities that the heat captured, that the other tested sensory modalities were lacking. All members of the group expressed a positive experience with the heat, as it possessed certain subtleness, coming on slowly, lingering in the background and then slowly fading away. This subtleness played well with the Feldenkrais experience, where external stimuli easily take focus away from the inwards-looking experience. Stroke and touch for example, became much too direct and took people out of the experience immediately, in that the focus shifted towards the sensory experience of the specific stimuli, whereas the heat stimuli became a more integral part of a compound experience of a specific body part.

Grounding in user accounts
There are multiple accounts from participants where the heat helped to direct attention to and keep the focus on different body parts. Many participants also claimed that the heat stimuli helped to bring back focus when the mind wandered (accounts translated from Swedish):

"*an extra injection to the practice, an awareness of everything arrived with the heat*"

"*I think in general the heat it is quite helpful also in focusing on the part of the body she is talking about.*"

Several participants also describe the heat stimuli as being sensed 'inside' the body, as noted by one participant:

"*The heat that comes is felt inside the body*"

II. Making space – temporal, interactive and spatial places for reflection
A second important quality significant to a somaesthetic appreciation design relies on providing a 'space' for reflection. Here we want to emphasize the dual meaning of 'making space'; on the one hand it concerns slowing down the pace of life and actively disrupting everyday habitual routines. On the other hand, it also has a quite literal, physical meaning: on our design work, it became important to build a secluded space, forming a certain atmosphere or feeling safe, enclosed, taken care of. This also corresponds to Schusterman's interpretation of James, noting that "*Attention to bodily feelings can also be enhanced by the strategy of warding off competing interests, since any form of attention constitutes a focalization of consciousness that implies ignoring other things in order to concentrate on the object attended*". (Shusterman, 2008)

Making space is more than merely creating a physical barrier blocking out light and sound. You should feel safe, taken care of, involved in an aesthetically evocative environment – communicated through the choice of materials and the interactions created inside this space.

Figure 3. How the enclosed space evolved as part of the breathing light prototype during the design process.

How is 'making space' manifest in our designs?
In short, softness of the mattress and the heat in the Soma Carpet helps to create for a cosy and calm experience. The form of the carpet also creates a particular space, fitting with your body size and your movements, that is yours to be inhabited. The Breathing Light has a similar private space mapped out underneath the strings hanging down. It serves both to exclude external stimuli, as well as making you feel safe and taken care of.

Grounding in the design inquiry
Early one, it became clear to us that external stimuli could easily overtake the experience. Whenever we were doing Feldenkrais exercises in our office we had to make sure the doors were closed, and we always brought a blanket to feel warm and covered and a yoga mat to lie on to make us feel we had our "own space".

In our design process, we tried, for example, to make the whole interaction take place in a tent, but that became too enclosed, almost claustrophobic. We also tried to design a lamp with a shield that covered the upper part of the body but that also become too enclosed. Finally we arrived at the fringes hanging down, allowing a slightly more transparent space.

Grounding in user accounts
Two experiences related to 'making space' are reoccurring in the participants' accounts. The most clearly stated one relates to encapsulation:

"you enter another room"

"to have your own small space"

"a room in the room"

"it is slightly open, it does not become so closed in and paranoid in there"

Interesting here is how one of our participants was troubled by how her legs were sticking out underneath the Breathing Light:

"And then I have the feeling that some part of bottom part of my body, like legs from the knees down, there not so much happened. And I think it's because the shape, like you got this dome thing and my legs were out the entire time and that's why I didn't feel a lot connection with my lower part"

The other reported experience relates more to the atmosphere of being in this space, where our participants use expressions such as cosy, calming, soft feeling, almost psychedelic.

III. Intimate correspondence – feedback and interactions that follow the rhythm of the body
A third important quality to somaesthetic appreciation design relates to the design and characteristics of various feedback loops, such as for example biofeedback, reinforcing or mirroring felt body experiences. Here we note, perhaps not so surprisingly, that for such feedback to support somaesthetic appreciation, *immediacy* and *synchronization* is key. It relies on a *correspondence* relationship – and it needs to be constituted as an *implicit* interaction – not explicitly engaging you in an active dialogue where you have to actively reply to the system as most other interface do.

Ingold [18] introduced correspondence to describe a type of intimate relationship between a subject and an artefact (such as between a cello player and his cello). In the kind of intimate correspondence we are aiming for here, the immediate and synchronized feedback rhymes with the rhythms and flows of the body in a way that the interactive system is perceived more as an extension of the body than as a separate entity or communication counterpart.

For the feedback to make sense its expression must also somehow correspond with the experience of the bodily experience being addressed. Part of this correspondence has to do with making careful mappings from what that system senses from our body to expressions – be it visualisations, heat or pulsating light. The feedback has to make sense and be meaningful vis-à-vis your biodata (as in designing with Biofeedback as proposed by Khut [23] and Sanches and colleagues [38]) or your affective state (as in the Affective Loops proposed by Höök [13]). The intimate correspondence relationship is similar to the interactions you would have with a mirror, where you are not really aware of the mirror per se.

How to design for this experience is hard as it becomes most obvious when it malfunctions. For example when a biofeedback is out of sync, it immediately causes breakdowns where the appreciation activity is replaced by reflections on the workings of the systems or the outside world.

How is the quality manifested in design?
In the Breathing Light the pulsating light is carefully synchronized with the breathing. In the Soma Carpet the wandering thermal stimuli is tightly synchronized with the voice instructions.

Grounding in design inquiry and user accounts
In the design work, we worked extensively with a problem that might seem very simple to solve – the synchrony between breathing and the dimming light feedback. The problem is that it cannot lag behind the breathing experience even with a few milliseconds. As soon as it does, users loose their sense of being in synch and their breathing is affected. Since the technologies in the prototypes were not always functioning perfectly, there are numerous examples of accounts from participants when problems with timing of heat or light create confusion and break the somaesthetic appreciation activity:

"And I don't know if it, it doesn't always sync up, because sometimes when you breathe out in a different way or something then it recognizes it as a breathing in so then the light turns brighter so sometimes it's off. And then it's kind of strange because then you are like 'I am breathing out, it should dim but it is breathing in' the light itself breathing in."

IV. Articulating experience – providing means to articulate the experienced bodily sensations

Finally, the fourth important quality that sets a somaesthetic appreciation design apart from other designs, concerns how to articulate the felt bodily experience. Articulating concerns both supporting the in situ activity of bodily introspection/reflection, as well as also supporting the externalisation and articulation of the experience after the session. In our examples of somaesthetic appreciation design, articulation is encouraged by the use of visualization and verbalisation. The voice that guides through the Feldenkrais exercise for example asks the participants to specifically think about their experiences in certain terms, such as heavy or elongated. As part of experiencing the Soma Carpet and Breathing Light, we also asked participants to articulate their experiences by drawing or writing on a piece of paper. We also tested the Sensual Evaluation Instrument [19] and asked participants to mould clay to express their experience.

The relationship between language, perception and how our experiences are affected by our ability to articulate them in words is a well-known and debated linguistic and philosophical topic discussed for example by Wittgenstein who among other things claims that we would not experience pain in the absence of understanding the word 'pain'. The relationship is also discussed in psychology and linguistics under the notion of the "Whorf hypothesis". Recent findings in psychology show that our ability to discriminate between colours is affected by the access to different linguistic colour terms [36]. Here Schusterman [44] proposes the use of linguistic tags as a resource that can be used to improve the nuances of the perception of the body:

"Linguistic tags or descriptions, for example, can make a very vague feeling less difficult to discriminate by tying that feeling to words, which are much more easily differentiated. James argues, for instance, that the different names of wines help us discriminate their subtly different flavours far

more clearly and precisely than we could without the use of different names. [..] The rich and value-laden associations of words can, moreover, transform our feelings, even our bodily ones. For such reasons, the use of language to guide and sharpen somaesthetic introspection – through preparatory instructions, focusing questions, and imaginative descriptions of what will be (or was) experienced and how it will (or did) feel – is crucial even to those disciplines of somatic awareness that regard the range and meaning of our feelings as going well beyond the limits of language."

How is the 'articulation' manifested in design?
In the recorded Feldenkrais exercises the participants are asked to specifically think about their experiences in certain terms, such as heavy or elongated.

Grounding in design inquiry
The importance of articulation became very prominent during the early stages of the design inquiry. In order to at all figure out what we were designing for, we had to find means of sharing the experiences with each other. As this form of body awareness we novel to several of the participants, we had to articulate the experience first of all to ourselves. But we also had to agree on certain qualities in the activities we were designing for.

The aim behind the systems we designed was to aid users in actively reflecting on the experiential and emotional aspects of the experience. To externalize these inherently subjective experiences of the felt body, making them available for scrutiny we had to find some instrument or form of expression. After testing different forms (verbal accounts, the Sensual Evaluation Instrument [19], free drawings, moulding soft clay and so on) we decided to use 'body sheets' inspired by methods used in physiotherapy. Body sheets consists of a rudimentary drawing of a human body on top of which participants can draw with different coloured pens (or write) what they feel in different parts of their body. Participants were asked to fill in one of these before engaging with our system and then another one after the session.

Grounding in user accounts
Some user accounts points to the importance of articulation:

"[..] if you would have just asked me in passing I wouldn't have noticed any of this. It was just the standing still and focusing and realizing 'ah my arms do tingle and my fingers are a bit yeah'"

The visual expression with several colours points to that the ability to draw with several colours can be understood as a resource to elaborate on the nuances in the experience, for example by creating mappings between colours and experiences:

"And the warm is orange because it wasn't that warm – it was just about the right warmth".

Also noted from an analysis of the drawings is that filled coloured areas in the drawings typically indicate stronger sensations such as pain.

GROUNDING HORIZONTALLY

While the previous sections has grounded our proposed somaesthetic appreciation strong concept vertically through providing design exemplars as well as anchoring the design process firmly in the somaesthetics theory, we also need to engage with and compare it with design exemplars and concepts proposed by others set it apart from other work horizontally. We will do this horizontal grounding by first analysing two design exemplars from other researchers and artists, which we believe are good examples of somaesthetic appreciation design. These exemplars will be analysed using the qualities identified in previous chapter to check that these four are indeed manifest in those designs. Second, the somaesthetic appreciation design concept will be described in relation to concepts and design work that we believe are *tangential* to this work. Somaesthetically-inspired design in HCI is reaching critical mass and we can start to describe classes of systems with different characteristics [6,9,10,17,21,23,25,27,28,29,33,35,39,40,41,42,50, 52,53]. Going through these we see a range of experiential qualities and embryos to strong concepts in formation that are sometimes similar to and sometimes different from Somaesthetic Appreciation.

Exemplars of somaesthetic appreciation design

Our first exemplar, the Sonic Cradle [52] we would frame as an excellent example of Somaesthetic Appreciation. The Cradle consists of a dark room where all external stimuli are removed, expect for a soundscape mirroring your breathing. The idea is that when meditating, your breathing pattern reveals when you loose focus. By subtly feeding your breathing pattern back to you, it nudges you back into a meditation state, taking back control of our breathing. The Cradle embraces most of the qualities that we identified as part of the Somaesthetic appreciation design concept; working with *making space*, both with respect to atmosphere as well as with blocking out disturbances, providing a *subtle* feedback as the cradle very effectively directs the attention to the activity of breathing. The cradle also embraces the quality of *intimate correspondence*, as several of its users claim to feel completely immersed in the resulting soundscape. The only quality that is not explicitly embraced concerns the articulation of the experience.

The second example we would like to bring up is the Slow Floor [6]. The Slow Floor takes the form of six timber and foam interactive walking pads with embedded force sensors connected to a microprocessor that measures the changing weight of a person's footsteps. This force and weight data is converted to sound sent to four speakers that surround the Slow Floor pad arrangement, create a tone. The force sensor change has an effect on the rate of this tone creating a "decelerating engine" sonic effect. Again, we note how the feedback is subtle, intimately corresponding to the walking on the floor. It is located in a confined space that allows for reflection and experience. Again, the articulation is perhaps not explicitly part of the design, but the awareness of your own footsteps in itself creates for a form of articulation and gained knowledge.

Tangential works

But there are also design experiments relating to somaesthetics theories that are tangential to our exploration – aiming for a slightly different somaesthetic engagement.

For example, Khut frames his art installations as engaging in *Biofeedback Loops* [23]. He borrows from biofeedback training in medicine, where electronic monitoring of moment-to-moment changes in a subject's behaviour or bodily processes is fed back in a manner that allows for learning to consciously controlling the behaviour observed. But instead of residing in a medical setting, Khut frames the biofeedback loop as an art installation, placed in an art museum, creating evocative visualisations as feedback to visitors' pulse, sweat and other behaviours.

Höök describes some of the work in her group as engaging users in *Affective Loops* [13]. These are similar to Khut's biofeedback loops, but here, the system not only mirrors users' behaviours, but also possess some agency of their own, persuading or engaging users to part-take in emotional-bodily processes induced by the system. Or as framed by Sundström [50], the system provides feedback to "*diminish, increase or disrupt the emotional process expressed by the user*". Examples of affective loop systems include Ghost in a Cave [37] and EmRoll [54]. In Ghost in a Cave, a big audience plays a game together. It is only when everyone in the audience gets into a strong aroused state (expressed as vigorous movements picked up by a camera) that their fish can enter into the caves, looking for the ghost. In EmRoll, two players have to dance together, breathe synchronously together, or be "scared" together in order to solve riddles in a game.

Löwgren and Hobye frame their work on the Mediated Body as addressing *Bare-Skin Connection* [29]. In their Mediated Body system, two users generate and engage in a soundscape that is created when they touch one-another's bare skin – similar to a theremin. It becomes an act of very intimate social play in public view.

Schiphorst frames her work as designing for *Somaesthetic Touch* and *Designing with Breath* [42]. The former is closely related to Bare-Skin Connection, but is a more generic concept, engaging with touch more generally. Designing with Breath is close to Somaesthetic Appreciation.

We note a strong family resemblance between all these concepts. They are all engaging subjects in moment-to-moment engagement, with their own somatics or that of others, or even with the 'somatics' of the machine. But then they differ in important ways from Somaesthetic Appreciation. Biofeedback loops draw the attention outwards – to external visualisations – rather than focusing on the inwards experience. Affective Loops are actively enforced by the system rather than engaging only in an intimate corre-

spondence. The Bare-Skin Connection happens in public spaces, facing outwards, in social, public settings.

In social situations, these designs seem to succeed when they thrive on the empathic feel we have of others and how easily we align our expressions with others when present, in the moment [31]. Co-experiencing [7], acting together, pulls the participants into the experience unfolding together with the system. The system can serve the role as an excuse to engage in intimate interactions (as in the Bare-skin interaction of the Mediated Body or the soft(n) system exemplifying the Somaesthetics of Touch by Schiphorst) or a trigger of joint synchronized behaviour (as in EmRoll and Ghost in a Case).

Outside the social realms, in individual use where the system mirrors somatic processes, engagements vary from those that succeed in helping users to turn inwards, directing their senses away from the surroundings (as in Somaesthetic Appreciation or Biofeedback loops), to those that succeed in spurring strong bodily engagement spreading over the assemblage of subject and interactive artefact (as in the Affective Loop examples). An interesting development here are those interactions that are slightly scary, as in the Machine Aesthetics experience of the Metaphone [47], or Uncomfortable Interactions [1]. Both in sense rely on the computer/machine as being foreign to us, pulling us into its "somatics", its inner workings, rather than probing our own somatic experiences. This takes us away from the Somaesthetic Appreciation concept and Shusterman's emphasise on the care for the self. At the same time they provide an important and interesting backdrop to understanding the concepts that are more strongly based on somaesthetic theories.

Let us point out that none of these potential strong concepts are 'better' or more relevant than others. They are forming the basis for a whole plethora of somaesthetically grounded design exemplars, varying in different dimensions of the experience sought or in their dynamic gestalt. In addition, as noted by Höök and Löwgren, strong concepts may well be overlapping. Here, we can note for example how Biofeedback loops are very close to both Somaesthetic Appreciation and Affective Loops.

While some of the strong concepts above are more stable than others and perhaps stronger in the sense of being more generative (that is reappearing over and over in different design works, by different design practitioners, for different domains), they all fulfil the criteria on what signifies a strong concept: they speak both of the system and of user behaviour and the interaction that may arise between them. They all attempt to capture a specific dynamic gestalt, a specific interaction experience that unfolds over time. In some cases, they seem to have the potency to go across design situations and even design domains, as when, for example, Khut moves his biofeedback loop systems from an art setting into medical care settings with children [23]. But they are not interchangeable. They emphasise different somatic experiences, different possible interactions. They,

for example, vary in how much agency they place in the interactive system, ranging from mirroring user behaviour to actively nudging, influencing, persuading or even taking control over the interaction. This in turn puts different requirements on the (digital) materials, modalities and interaction techniques that may be used to achieve a particular dynamic gestalt. In the Somaesthetic Appreciation, as discussed above, it is very important not to rely on visualisations or other stimuli that pulls subjects' attention to the outside world. This is quite different from Biofeedback- and Affective Loops.

To explore how generative the Somaesthetic Appreciation concept is outside our own design work, in other domains, we have, for example, arranged a hackathon at IKEA, where the somaesthetic ideals and our soma-brainstorming method were introduced to ~20 designers. A whole range of furniture designs were created in a one-day workshop. Some of them captured the kind of aesthetics we were looking for, while others were perhaps less relevant. By populating this somaesthetic design space with a whole range of such designs, the design pattern will take a clearer dynamic gestalt. It will continue to fill our Somaesthetic Appreciation concept with meaning and examples, which may guide others entering into this space.

DISCUSSION
In summary, we have identified and grounded (vertically and horizontally) a novel strong concept arising from our design work: Somaesthetic Appreciation. Designs that fall into this realm share certain experiential qualities: a *subtleness* in how they encourage and spur bodily inquiry in their choice of interaction modalities, a requirement on *making space* shutting out the outside world – metaphorically and literally – to allow users to turn their attention inwards, an *intimate correspondence* between movement and interaction. In terms of modalities, our experience so far says that modalities that allow for a felt, subtle, inward-looking experience are key. Anything that puts too much emphasis on explorations outside your own body, such as 3D sound or visualizations in the ceiling directing your attention outward, will not work. And again, the modality has to subtly attract your attention, guiding without demanding. We found the aesthetics of heat particularly evocative in our work. Heat is intimate and skin-close, but, when not too hot, rather than being crude or invasive, produces a welcoming somatic response, opening our mind to the sensations and questions posed by the accompanying vocal instructions. Finally, Somaesthetic Appreciation designs help *articulation* of bodily experiences in turn leading to increased ability to articulate and discriminate between different experiences – promoting body awareness.

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