Somaesthetic Design

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Insights

- Somaesthetic design focuses on making people more aware of their felt bodily experiences.
- To design for somaesthetics, designers must develop their own somaesthetic expertise.
- Somaesthetic design holds great promise, but more examples of how to translate from abstract theory into design practice are needed.

ALL PHOTOS BY HENRIK PALMBERG

We are surrounded by a plethora of new technologies—biosensors worn on the body, interactive clothes, and wearable computers, such as mobiles equipped with accelerometers. A whole space of possibilities for gesture-, physical-, and body-based interaction has been opened. But despite all the work we have seen on designing for embodiment, the actual corporeal, pulsating, live, felt body has been notably absent from both theory and practical design work. Most design work has taken a quite instrumental view on interaction: Our bodies are there to be trimmed, perfected, and kept free from illnesses and bad influences [1]. By placing some sensors on our body and then having the data fed back to us, we are supposed to be able to change our bad habits, become healthy and beautiful, and live a long life.

In the Soma Project, we searched for an alternative design stance that would not distract us from our own experiences but instead deepen our understanding and engagement with ourselves. Through adopting a *somaesthetic* design stance, we took on the challenge of engaging participants in deepening the experience of their own felt bodily sensations and movements rather than external sensory interactions.

THE FELT SOMAESTHETIC EXPERIENCE

She came rushing into the room, and as she lay down on the Soma Mat, she felt stressed and distracted. Her jittery thoughts were jumping from one urgent work topic to another. She forced herself to push her worries aside and to accept that she would now spend a whole hour in this room, on this mat, and that it would be good for her. As she lay down, adjusting her body, she noticed how the pain in her hip was acute, throbbing with painful nerve signals all the way down into her calf and heel. She briefly reflected on how easy it was to forget the pain when her mind was elsewhere. Now she had to face it. She closed her eyes and the familiar voice started, asking her to accept where she was today—not to evaluate it, but to accept it. She felt a short pang of empathy with herself and her pain. Through her eyelids she noted how the Breathing Light above her increased and decreased in intensity, following her breathing. She took a deep breath and relaxed. As the voice asked her to focus on her left heel, the mat heated slightly under her foot. She noticed how cold her feet were and the pleasure of the warmth.

An hour later, as she was asked to slowly sit up and find the horizon in front of her eyes, she was pleased by her altered state of mind. She felt totally present in her body, empathic with herself and the others around her. The pain was more present, but she did not feel she had to push it away. (Diary note by Kristina Höök using the Soma Mat and Breathing Light)

By now, you might be worried that this is some New Age philosophy or religious movement. But let us explain: The Soma Mat and Breathing Light designs are entirely based on everyday familiar bodily movements and experiences. There is no mystery at all. The interaction is simply a return to the most basic pleasures in life: our own movements.

SOMAESTHETICS

The Soma Mat design comes from an exploration of *somaesthetic design* processes done at the Mobile Life Centre in Stockholm, together with our industrial partners, IKEA and Boris Design.

Somaesthetics is an interdisciplinary field, originally proposed by the philosopher Richard Shusterman and grounded in pragmatist philosophy and phenomenology [2]. 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. A key premise of the somaesthetic philosophy is the insight that all of our experiences and interactions with the world happen through our body. Learning how to know and better use our bodies is as important as educating our minds. This applies both to the motoric 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.

Shusterman points out that the early Greek philosophers strived to educate both mind and body together but that most Western philosophy has since placed more emphasis on educating the mind as a separate entity from our bodies—to him a futile endeavor.

SOMAESTHETIC EXPERTISE FOR DESIGNERS

But how do you design for somaesthetic experiences? Let us describe a few insights gained from our design journey.

Attaining somaesthetics skills. First, we had to explore our own somaesthetic appreciations as designers. During a whole year, we engaged in bodily practices at least once a week, for the most part a practice named Feldenkrais [3]. In short, Feldenkrais exercises aim to extend our repertoire of movements—or perhaps remind us of the many ways we can move—to reduce pain or strain, but also to enjoy our own bodies, inner organs, and movements. For every movement you do, such as walking, turning your head, or breathing, there should be at least three different ways you can do it. For example, to stop breathing, you can contract or expand the muscles in your throat, contract or expand the diaphragm, or contract or expand your abs. The Feldenkrais exercises are done extremely slowly in order to send nervous-system signals back to your brain to be decoded and turned into patterns of movements that become readily available to you. There are hundreds of different exercises you can do. The exercises are playful and engaging on a deep level, and they increase your knowledge and awareness of muscle movements, tendons, ligaments, and fascia, as well as inner organs such as your lungs.

A Feldenkrais exercise requires that you turn your attention inward, listening to your bodily signs and signals. In our exercises, we often started with describing our feelings before an exercise and then again after the lesson. In the descriptions following an exercise, we would report on, for example, having felt that one leg was longer than the other or that one side of the body felt orange while the other was black and burnt. Stress symptoms, strain, and pain were often reported in a more qualified manner after an exercise. We also found that we spoke more of the functions and experiences of our inner organs.

A typical Feldenkrais lesson consists of probing questions given to you by the instructor. You are not supposed to answer them, but rather use them to guide your attention to different parts of your body and bodily processes. The lesson will then ask you to engage in very slow movements, for example, breathing slowly all the way down into your legs, again through questions probing what you can feel in your legs as you breathe.

In order to properly learn a somatic practice like Feldenkrais, it is important to work with someone knowledgeable—or, in the words of Thecla Schiphorst: a *somatic connoisseur* [4]. In our work, we started with a two-day workshop led by Richard Shusterman. Apart from being a philosopher, he is also 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 Kristina Strohmayer, also a trained Feldenkrais practitioner.

Feldenkrais is but one of the possible bodily practices we could have engaged in. Other designers have engaged in other bodily practices to ground their design: move to be moved [5], palpable experiences of touch [6], biofeedback loops [7], and even horseback riding [8], to name a few.

Somaesthetic brainstorming. Apart from training our own

somaesthetic appreciations, we had to find ways of translating those insights into design work.

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.

But what was even more interesting was how these lessons influenced our brainstorming exercises. In a typical brainstorming session, ideas are aggressively put out there in rapid succession, one person taking up someone else's idea, changing it, turning it around, shifting perspectives. In the brainstorming sessions that followed a Feldenkrais exercise, we found that our ideas formed more slowly. They felt more honest, closer to our hearts and desires. The interactions we envisioned were delicate, sensitive to our bodily processes.

Since the project started, we have brainstormed in many different settings, with different groups of people. In general, the same experiences and considerations reappeared every time. While we cannot claim to have any solid proof that the resulting designs become qualitatively better, we certainly enjoyed the process much more and felt that we became more honest and focused. In particular, we felt that it helped us get a grasp on the elusive aesthetics of bodily interactions.

Design process—the importance of the materials. When bringing out the three designs presented below, we repeatedly had to try different digital and physical materials, faking interactions 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.

As expressed by Jonas Löwgren and Erik Stolterman, we had to test the *dynamic gestalt* of the interaction [9]. In this loop of design, test, fail, and redesign, we tried a whole range of modalities. We worked with vibrations as feedback, but even very subtle vibrations were distracting. We tried 3D sound with a localized voice as feedback, but the movement of the voice did not help us to focus on some specific movement or part of our body; instead, it drew our attention to the outside world. We tried a moving light with the same negative result. Visualizations were also distracting. And so on. It was not until we engaged with heat and dim light perceived entirely through our eyelids that we found modalities that made sense.

Figure 1. The Soma Mat.

Our search was not entirely uninformed. For example, we studied compassion methods and met with a compassion therapist who told us about heat as a very intimate sense that many patients struggled with. Patients with anxiety problems and deliberate self-harm behaviors would typically avoid being touched and would even, when sitting, avoid the heat generated by their own hands resting on their legs. Their reaction came from being in a perpetual fight-or-flight state, in which their whole system was set on aggressive alert. The first step in compassion therapy would be to approach a state where they could deal with heat feedback, as it is intensely intimate. This triggered our interest in this modality.

In our design-test-fail process, we also had to consider the different physical materials that would interact with the heat or dim light. The Soma Mat, for example, had to be equipped with a layer of foam that was neither too thick nor too thin. Here, we were informed by Feldenkrais theories, which prescribe making contact with the floor through a thin mattress, in order to be grounded and carried by the floor.

SOMA MAT, BREATHING LIGHT, AND PRESSURE MAT

Let us now turn to three examples of what we designed with Kristina Strohmayer and the designers at IKEA and Boris Design. All three prototypes have been designed with Feldenkrais exercises as a starting point. They are designed primarily to be used as a

complement to a Feldenkrais session.

The Soma Mat—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 [10].

With the Soma Mat (Figure 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 by Strohmayer. When she 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. We had to work hard to make the heat subtle enough to not distract but at the same time be at all perceivable. When we found the right tempo, heat intensity, and interaction with the vocal instructions, the experience became intensely pleasurable while helping to deepen the guidance obtained from the questions she was posing in the lesson.

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 (Figure 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. Again, we had to work hard to find exactly the right color of light, the right dimming intensity, and the right pace. Only then would any of these factors help deepen your experience rather than detract from it.

When you lie down on the Soma Mat 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. The overall response to this prototype both in user studies and demo situations has been overwhelmingly positive, especially with regard to the calm and aesthetic experience, where the external world tends to fade away.

The Pressure Mat—Reinforcing small movements. In the third prototype, we chose to focus on movement. When engaging in Feldenkrais exercises, you often perform small, slow motions, exploring how they connect to different parts of your body. You might be asked to probe how your limbs and spine follow your movement or how the pressure onto the floor changes. The underlying theory is that by coordinating movements, your brain will learn the combination and the movement pattern will become a part of your repertoire.

The Pressure Mat prototype is a mattress equipped with pressure sensors. As you lie down on it, a visualization appears on the ceiling above you. The Pressure Mat detects very subtle body movements, mirroring them in evocative visualizations overhead. Unfortunately, the visual focus of this prototype draws too much attention away from your inner experience of the movements, so we are working on changing it into generated sounds—a musical landscape—triggered by your movements. Our speculation is that because our visual sense is our dominant sense, there are many habitual processes that immediately come into focus when we engage visually. By closing our eyes and lying down on the floor, we immediately leave habitual practices behind. In addition, many of the Feldenkrais lessons are done with closed eyes in order to help us focus on our inner experience rather than shifting our attention to the outside world.

When people get to test the Pressure Mat, they are usually mesmerized by the interaction. In that sense, it is not at all a failure. But it fails to capture the specific inward-listening somaesthetic experience we are after.

CHALLENGES TO IXD RESEARCH

While we, based on our own experiences, are totally convinced of the potency and agency of the somaesthetic theories, there are still a whole range of issues that need to be resolved to validate and properly document this approach to design. Let us outline some of the issues we are struggling with right now.

Somaesthetic knowledge articulation. First, we have been designing for and with ourselves in a form of autobiographical design process [11]. While this is a well-known and recognized manner by which design is often done—both in academia and in design practice—it needs to be properly described and accounted for academically if we want to claim any validity or generality for the resulting designs. We might ask questions such as: How can you claim that your Soma Mat and Breathing Light work while the Pressure Mat does not, simply based on your own design judgment and personal experience of using them? How can we trust your claim that the other modalities did not work—couldn't they have worked if you had designed them differently?

One way of generalizing from the specific insights we gained and testing what we learned is to articulate *experiential qualities* and *strong concepts* [12] that can travel into other design situations. An experiential quality describes the experience between user and system that we strive to achieve. It often serves an *evaluative* purpose in the design process. A strong concept, in contrast to an experiential quality, must be *generative*—spurring more than one application. A strong concept concerns the interactive behavior of an application, including both a design element and a use practice and behavior unfolding over time.

We are in the early stages of articulating those more generic insights, but here is a first attempt. First, we name the experiential quality we are trying to isolate *Turning Inwards*. The dynamic gestalt we seek to capture with Turning Inwards is associated with experiences such as slowness, subtleness, movement, delicate touch, and care. This does not imply losing contact with the outside world—your contact with the mat and the feeling of the surrounding space is also maintained and helps you go inward; so it is a kind of turning inward from outward. Any interactive technology in that equation must not distract you, but instead aid you in going further into listening to your own somatic signs and signals. While this experience is intriguing in itself, it is also a learning process that helps you shift your bodily knowledge. (As a side note: While it may seem like the

ultimate selfish activity, we learned that as you become more aware and empathic with yourself, you also become more empathic with others). Through the choice of interactive behavior for the system, we aim to avoid bringing any attention to the outside world or to the surface of your body. This can be contrasted with, for example, the Mediated Body experience by Mads Hobye and Jonas Löwgren [13], where the whole purpose is to bring attention to another participant through touch. Instead, the interactive experience we seek is turning your attention inward, making you enjoy your own body, your own inner organs, your own slow movements, the joints and connections between different parts of your body, and the symmetries and asymmetries of your body. Through the articulation of this experiential quality, we were able to steer the design process, evaluating and making choices between different possible interactions.

We name the strong concept arising from our design work *Somaesthetic Appreciation*. A Somaesthetic Appreciation design will engage in specific interactions when it comes to *timing*, *modalities*, *aesthetics*, and *intensity* of feedback. In terms of timing, we found that the system has to be right there, right when you turn your attention to some part of your somatic experience. It cannot arrive too late or too soon. It also needs to arrive subtly, increase in intensity, and then disappear slowly—not in an on-off fashion. 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; it cannot be crude and 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, throughout our design efforts, we had to work hard to get the right intensity—no matter which modality—of feedback. If the heat got too hot, it failed. If the Breathing Light was too subtle or too strong or too colorful, it failed. And so on.

Figure 2. The Breathing Light.

To explore how generative the Somaesthetic Appreciation concept is, we have, for example, arranged a hackathon at IKEA, where the somaesthetic ideals and our soma-brainstorming method were introduced. 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 less relevant. By populating this somaesthetic design space for inner experiences with a whole range of such designs, we may start to see a pattern forming. We can extract a set of design sensitivities and aesthetics, filling our Somaesthetic Appreciation concept with meaning and examples, which may guide others entering into this space.

Gap from theory to design. A second problem that arose in our work with somaesthetic theory is the gap between the theory introduced by Shusterman and the actual design work—which is why we have been attempting to articulate the Turning Inwards experiential quality and the Somaesthetic Appreciation concept. While there is often a gap between "grand" theories and design, in somaesthetics the gap is wide for a particular reason: Somaesthetics is concerned with *felt* bodily experience. While our description of the Soma Mat experience may tell you something about what it does, it will not communicate why this interaction in turn will make you more body-aware. In fact, to some people the whole concept of body awareness is abstract, something they have never experienced. Shusterman speaks about this himself when asked about the "truth" of his theories. He says that it is easy to lie about a bodily experience. The words used to describe what happens when you engage with your soma aesthetically may sound amazing, evocative, or mysterious, but it is only when we experience it that we really get access to the truth of what it entails. In his own work, he knew he could not articulate his theory of somaesthetics without becoming a

Feldenkrais practitioner himself. Only then would he have the expertise and authority to speak about this embodied form of knowing in a qualified manner.

The experiences we speak of here are not fluffy, unspecific, or mysterious. They are distinct and clearly discernable to those who engage in them. But they became discernable to us only after engaging in a long learning process. The translation into design was a painstakingly long and difficult journey, as there were too few other interactive experiences we could rely on to form our design thinking. In fact, it was only after our design journey that we could recognize the experience in descriptions of others' designs (such as Soft(n) [14] or the Meditation Cradle [15]).

Adding to the confusion when designing for somaesthetic experience, the theory encompasses a whole range of bodily experiences—not only inward-listening meditative experiences, but everything that contributes to an aesthetic experience relating to the body. For example, Shusterman talks about creative self-fashioning, such as tattoos, as one example of somaesthetics. Tantric sex or haptic experiences of eating are other examples. These are obviously very different experiences. Thus, while somaesthetic theory helps us direct attention toward our bodies and the potential for rich somatic experiences, and guides some of our design inquiry, the topic is as enormous, diverse, and challenging as, say, designing for the Web.

The question is, how we are going to deal with the gap between the theory and practical design work in IxD? Body awareness and mastery take time to train; this is not as accessible as some of our other design insights that we can easily grasp and apply in many design situations.

Accessing and articulating bodily experiences. A third problem that arises, as mentioned briefly earlier, is how to do user studies of these systems. A key experience from this work concerns the volatile, impalpable nature of human experiences, and more specifically the experiences of one's own body. The problem is twofold. On the one hand, it concerns the ability to get access to the sensations of the body, and the skill of interpreting and making sense of these sensations. On the other hand, it is not trivial to articulate and share these experiences with others. If we ourselves had problems articulating the experience we sought and had to spend a whole year learning Feldenkrais before being able to design for it, how could we expect participants in our studies to effortlessly articulate what they experienced when interacting with one of our prototypes?

For the formative studies, where we seek to change and fine-tune the design, it might be that we have to look for the somatic connoisseurs mentioned earlier to provide the feedback we need. But for validation of whether the system is doing what we claim it does, we also need to bring in those less experienced in describing their bodily experiences.

In the Soma Project, we have done some initial user testing. Here is an example of what one of our participants said:

And one thing is the heat makes the feeling and the appearance of those areas change. So, the simple explanation is they get smaller and larger. If the heat goes on, I could easily compare that, so now the space feels larger than on the other side and vice versa.

To us, this all makes sense and is helpful design input, but maybe it makes less sense to you as a reader, someone who has not lain down on the Soma Mat and felt the heat under different parts of your body, slowly gaining insights about your own soma?

When working with the Feldenkrais sessions in our group, we always ended with discussing and sharing our experiences. 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 colors (blue or black), materials (rubbery), weight (light or heavy), or spatiality (elongated or compacted).

Quite early in our initial studies, we decided to go with an approach where the participants sketched their experiences on a piece of paper containing an outline of a human body. Both text and drawing were encouraged, depending on preferences. In some variants of the approach, we added inspirational resources, such as words that were often used by others. We also tried using the set of figurines in different shapes previously used in the *sensual evaluation instrument* [16] as a resource for expressing affective experiences. In combination with this, the participants were also given lumps of soft clay, which they could use to form shapes that in some way corresponded to their experience.

We believe this user-study problem is not unique to somaesthetic experiences, but rather is an overall neglected problem in HCI when it comes to expressing experiences in general—and specifically, experiences that could be referred to as aesthetic or affective. We do not have a qualified language to speak about different aesthetics and whether something provided the right aesthetic experience or not.

Should we interfere with the body in the first place? Finally, when presenting our work, we are often asked why we introduce technology into these settings at all. In a sense, your body is always there for you, and you might do better by just listening to your own experience rather than relying on some interactive technology to enforce or feed back your own somatic signs and signals. Shusterman comments on this:

First, no technological invention of virtual reality will negate the body's centrality as the focus of affective, perceptual experience through which we experience and engage the world. Second, cultivating better skills of

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.

body consciousness can provide us with enhanced powers of concentration to help us overcome problems of distraction and stress caused by the new media's superabundance of information and stimulation [17].

To his two arguments, we would like to add how somaesthetics may help us create better designs not only to increase body awareness per se, but also as a part of any design relating to our bodily ways of being in the world. We worry about all the poor designs that surround us today. Whether we like it or not, technology has become intimately intertwined with our being in the world and is ever present in mediating our interactions with our surroundings. If we limit our design concepts to the instrumental ones, forgetting the diversity of aesthetic, playful, and enjoyment experiences we could be engaging with, we will fail to create for that which is essentially human. Maybe we need to ask whether we can afford *not* to engage with somaesthetic design.

FORMULATING A SOMAESTHETIC DESIGN PROGRAM

The Somaesthetic Appreciation design concept and the Turning Inwards experiential quality are very early articulations of our design insights. More work is needed. But the growing interest in this topic will allow us and others to fill in the gaps stepwise, providing a better way of articulating and qualifying different aesthetic considerations we must engage in as wearables, mobile technologies, and Internet of Things technologies creep closer and closer to our most intimate interactions. Or, expressed through the fears of Guiseppe Longo:

Electronics, robotics, and spintronics invade and transform the body, and as a consequence of this, the body becomes an object and loses its remaining personal characteristics, those characteristics that might make us consider it as the sacred guardian of our identity [18].

Let us counteract his worries and be careful with how we transform our bodies through the technologies we put out there.

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ENDNOTES

1. Purpura, S., Schwanda, V., Williams, K., Stubler, W., and Sengers, P. Fit4life: The design of a persuasive technology promoting healthy behavior and ideal weight. *Proc. of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, New York, 2011, 423–432.
2. Shusterman, R. *Body Consciousness: A Philosophy of Mindfulness and Somaesthetics*. Cambridge Univ. Press, 2008.
3. Feldenkrais, M. *Awareness Through Movement*. New York, 1972.
4. Schiphorst, T. Self-evidence: Applying somatic connoisseurship to experience design. *CHI'11 Extended Abstracts on Human Factors in Computing Systems*. ACM, New York, 2011, 145–160.
5. Hummels, C., Overbeeke, K.C., and Klooster, S. Move to get moved: A search for methods, tools and knowledge to design for expressive and rich movement-based interaction. *Personal and Ubiquitous Computing 11*, 8 (2007), 677–690.
6. Schiphorst, T. Really, really small: The palpability of the invisible. *Proc. of the 6th ACM SIGCHI Conference on Creativity & Cognition*. ACM, New York, 2007, 7–16.
7. Khut, G. *Development and Evaluation of Participant-Centred Biofeedback Artworks*. Unpublished doctoral exegesis, University of Western Sydney, 2006.
8. Höök, K. Transferring qualities from horseback riding to design. *Proc. of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries*. ACM, New York, 2010, 226–235.
9. Löwgren, J. and Stolterman, E. *Thoughtful Interaction Design: A Design Perspective on Information Technology*. MIT Press, 2004.
10. Mentis, H.M., Laaksolahti, J., and Höök, K. My self and you: Tension in bodily sharing of experience. *ACM Trans. on Computer-Human Interaction 2*, 4 (2014), 20.
11. Neustaedter, C. and Sengers, P. Autobiographical design in HCI research: Designing and learning through use-it-yourself. *Proc. of the Designing Interactive Systems Conference*. ACM, New York, 2012, 514–523.
12. Höök, K. and Löwgren, J. Strong concepts: Intermediate-level knowledge in interaction design research. *ACM Trans. on Computer-Human Interaction 19*, 3 (2012), 23.
13. Hobye, M. and Löwgren, J. Touching a stranger: Designing for engaging experience in embodied interaction. *International Journal of Design 5*, 3 (2011).
14. Schiphorst, T. soft (n): Toward a Somaesthetics of Touch. *CHI'09 Extended Abstracts on Human Factors in Computing Systems*. ACM, New York, 2009, 2427–2438.
15. Vidyarthi, J., Riecke, B.E., and Gromala, D. Sonic Cradle: Designing for an immersive experience of meditation by connecting respiration to music. *Proc. of the Designing Interactive Systems Conference*. ACM, New York, 2012, 408–417.
16. Isbister, K., Höök, K., Sharp, M., and Laaksolahti, J. The sensual evaluation instrument: Developing an affective evaluation tool. *Proc. of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, New York, 2006, 1163–1172.
17. Shusterman, R. Somaesthetics. In *The Encyclopedia of Human-Computer Interaction, 2nd Ed*. M. Soegaard and R. Friis, eds. Interaction Design Foundation, 2013.
18. Longo, G.O. Body and technology: Continuity or discontinuity? In *Mediating the Human Body: Technology, Communication, and Fashion*. L Fortunati, J.E. Katz, R. Riccini, eds. Lawrence Erlbaum & Associates, 2003.

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