Soma Corset

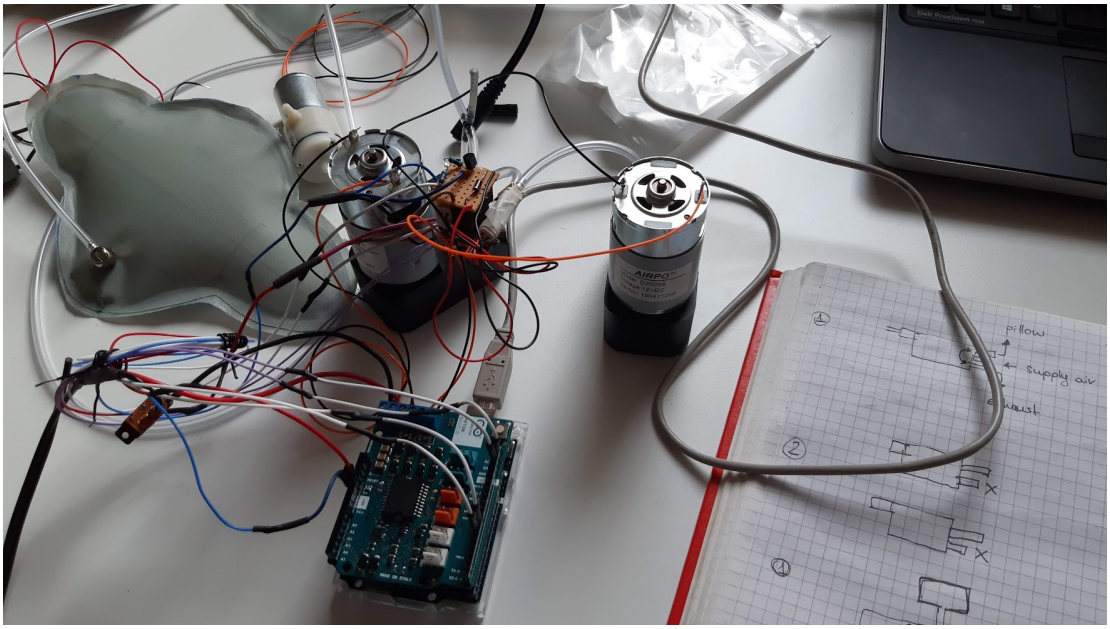
Description: The project started as a collaboration with the classically trained singer, who wanted to create an innovative musical instrument capable of producing music based on the physiological data acquired from her torso, but omitting the vocal component. The shape of the garment resembled a corset used by classical opera singers. We started our design process with off-the-shelf breathing sensors and the predefined locations on the body, but this didn't work since those sensors could not capture muscle contractions happening within the torso of the singer. Later, we constructed shape-changing pillows sensitive to pressure capable of tracking changes taking place in the singer's body. We have also explored the torso area of the body for unconventional locations reflecting the process of singing (i.e. lower back). All this resulted into a musical instrument — Breathing shell. At this stage, we solely looked into the possibilities of using tangible shape-changing interfaces primarily for sensing breathing

In the second stage of the project, we looked into the opportunities of using shape-changing interfaces as the means of actuation. We were inspired by Deep Pressure Therapy (DTP) and tried to understand it from a design perspective, to see if it can be used outside of the medical environment and what can be learnt from it, especially in connection with the process of breathing. This project allowed us to discern four experiential qualities of breathing: symmetrical versus asymmetrical placements of the actuation elements on the torso, experiencing breathing in different body parts, synchronous vs asynchronous breathing feedback and breathing correspondence — the experience where it is unclear whether the system or the user is driving the breathing rhythm.

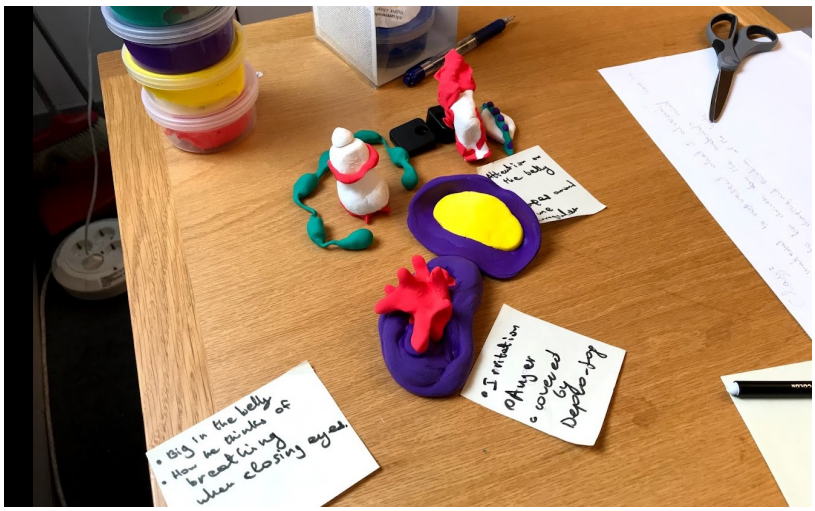
The design presented in the later stages of the Soma Corset project builds on the insights from the two previous stages and develops them further by coupling sensing and actuation via shape-changing elements through a set of interactive behaviors. All in all, the design process lasted for eighteen months, and was grounded in soma design as the main design and research method. The process involved cultivating somatic sensibilities via breathing practices, exploring a diverse spectrum of physical and digital materials, long-term usage of different prototypes, fast tinkering, multiple iterations of the technology, and continuous data collection through different media such as textual notes, video and audio recordings, illustrations, photographs, and both planimetric and stereometric body maps. The design process culminated in an interactive restrictive shape-changing garment, the Soma Corset, with which, during later stages of the design process, our team formed long-term relationships by exploring and reflecting upon our experiences of four orchestrated breathing exercises that we tested over a longer time span.

The Soma Corset: front and back views

Experimenting with breathing sensors (from left to right): a piezoelectric flex sensor, an EMG sensor, an accelerometer, a shape-changing pillow



Experimenting with different designs for the shape-changing units



Clay figures portraying experiences after performing the breathing exercises. A wooden figurine with plasticine reflecting the experience of wearing the corset.


Corset (Breathing Shell) as a musical instrument; garment constructed from Worbla Thermoplastic and from dense fabric with plastic ribs.


Experiments with breathing feedback on either side of the torso; sharing breathing


Early testing sessions. The Soma Corset's behavior is controlled via a smartphone

Snippet from the project's diary

Methods Used: Embodied sketching such as bodystorming, body maps, diaries, prototyping (low to medium fidelity)

Technology Used: Arduino, Processing, Miro

My Role: I was leading the project; participated in group design work and conceptualization. I devised the design of the study at the later stages of the project, constructed and re-iterated the hardware and firmware for the sensor-actuator units for the Soma Corset.

Publications: Kelsey Cotton, Pedro Sanches, Vasiliki Tsaknaki, and Pavel Karpashevich. 2021. The Body Electric: A NIME designed through and with the somatic experience of singing. In Proceedings of the 2021 International Conference on New Interfaces for Musical Expression (NIME'21).

Vasiliki Tsaknaki, Kelsey Cotton, Pavel Karpashevich, and Pedro Sanches. 2021. "Feeling the Sensor Feeling you": A Soma Design Exploration on Sensing Non-habitual Breathing. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21).

Annkatrin Jung, Miquel Alfaras, Pavel Karpashevich, William Primett, and Kristina Höök. 2021. Exploring Awareness of Breathing through Deep Touch Pressure. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21).

Pavel Karpashevich, Pedro Sanches, Rachael Garrett, Yoav Luft, Kelsey Cotton, Vasiliki Tsaknaki, and Kristina Höök. 2022. Touching Our Breathing through Shape-Change: Monster, Organic Other, or Twisted Mirror. ACM Transactions on Computer-Human Interaction (TOCHI) 29, no. 3 (2022).