Sarka: Sonification and Somaesthetic Appreciation Design

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ABSTRACT
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 learn to perform or design for. With the Sarka mat we want to support the ability to direct attention by providing sound feedback linked to the weight distribution and motion intensity of different parts of the body, and to provide an exemplar for how such design may be conducted. The process of Sarka's creation is informed by Somaesthetic Appreciation Design. We discuss how a sonic feedback signal can influence listeners, followed by how we, in this design, worked to navigate the complex design space presented to us. We detail the design process involved, and the very particular set of limitations which this interactive sonification presented.

Author Keywords
Somaesthetics; Sonification; Carpet; Biofeedback; Feldenkrais; Somatic Appreciation Design; Somatic practices.

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

INTRODUCTION
This article details the creation of the Sarka mat: the design process involved, and the particular set of limitations this interactive sonification [13] presented. With Sarka the small movements and weight distribution of a person in supine position are interactively sonified, from the real-time data captured by 8 piezorsesistive force sensors distributed across two wooden sections under the person's torso and pelvis. 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 Sarka mat (Figure 1) we want to support the ability to direct attention by providing sound feedback of the weight distribution and motion intensity of different parts of the body. Our intention is to create a sonic feedback device that can serve as an alternative or complement to existing somatic practices and body awareness practices. Its' creation is a result of our continuing exploration on how somaesthetic theory can serve as theoretical foundation for design of technologies on or around the body. The Somaesthetics theory explores somatic practices and demonstrates how they can lead to the attainment of fulfilling experiences [29]. The process of Sarka's creation is informed by Somaesthetic Appreciation Design [14]. Briefly, it addresses how we can translate somaesthetic theory to design, opening up a design space where the interaction subtly supports users' attention inwards, towards their own body, enriching their sensitivity to, enjoyment and appreciation of their own somatics. This previous work proposes four main qualities that are essential when designing for somaesthetic appreciation: using subtle guidance of attention, providing a space for reflection, creating intimate correspondence, and encouraging the articulation of the experience. We will further expand upon somaesthetic appreciation design, and keep referring back to it throughout the article, to connect to how it has informed our design choices.

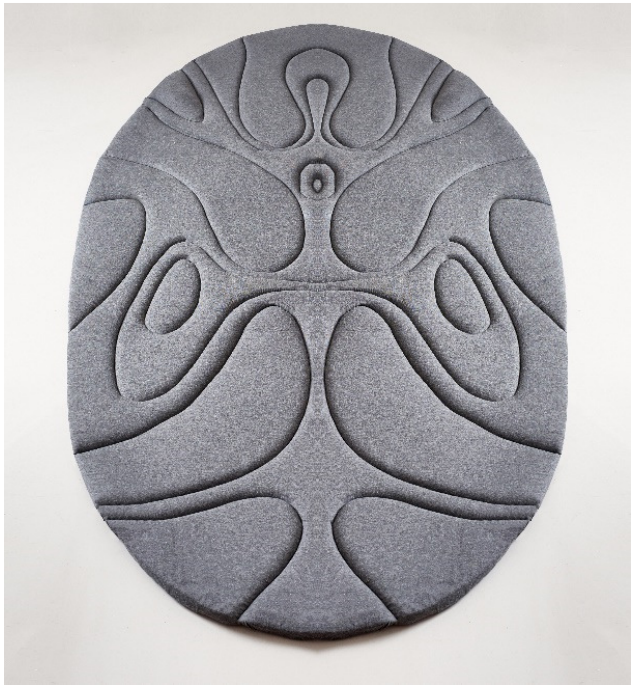

Figure 1 - Illustration of Sarka. The sewn patterns help align the body of the person lying down with the sensors underneath the mat. Cabling and speakers/headphones are not shown.

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Biofeedback is the process of allowing people to monitor and learn from electrophysiological measures of signals their body produces: a sort of 'psychophysiological mirror' [25]. The biofeedback users are taught a training procedure to practice, the effect of which is reflected through the feedback stimulus. Following training, the users learn to regulate their physiological processes, even in the absence of feedback. Predominantly the feedback signal used is visual, but in many contexts a sonic signal is preferred. We are not the first to draw inspiration from biofeedback to create experiences that have an aesthetic, rather than therapeutic aim [17, 30]. Here, we harness the concept with the broader aim of heightened somatic awareness.

This work is specifically targeting sonification in relation to the subtle and small movements carried out in certain somatic awareness practices, such as the Feldenkrais technique. Feldenkrais is a somatic educational system consisting of a set of body awareness exercises [6]. It is based on the assumption that increasing a person's kinesthetic and proprioceptive self-awareness leads to increased function, reduced pain, and greater ease and pleasure of movement. We find these exercises based on small movements an interesting candidate for sonification biofeedback, our intention being that a person will better perceive and reflect on the movements, if they are presented back to the person through a magnifying physiological mirror.

Our intention with this research is to learn more about the design space where Sonification and Somaesthetic Appreciation Design meet. From this learning process we create a prototype mat, which we will, in future research, use as a basis for designing somatic exercises which are created specifically for using this mat, to harness the specific advantages it presents, while also avoiding the known points of incompatibility with existing practices.

BACKGROUND

Somaesthetics is an interdisciplinary field, originally proposed by the philosopher Richard Shusterman and grounded 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 [7]. Schusterman stresses that not only is movement and the living body the lens through which we can understand the world, this "tool of tools" is also mouldable. 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. To improve our somaesthetic appreciation or body awareness, we need to reflect over our bodily actions and movements, in ways that shift us out of our habitual movements and response 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. Shusterman proposes that a somaesthetic agenda by necessity also comprises a practical strand: to engage in somaesthetics relies on and requires also engaging in somatic bodywork, such as yoga, meditation, Feldenkrais, or Alexander-technique. In the design work presented below, we engaged in Feldenkrais-exercises. 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 [9]. If we have pains or difficulties in engaging in certain movement patterns, there will be several alternative ways of performing the same movement. In Feldenkrais-lessons we perform movements extremely slowly, so that we can re-learn and extend our repertory of movements.

Somaesthetic appreciation design has previously been suggested in [15] as a strong concept that addresses how we can translate somaesthetic theory to design, opening a design space with many different applications where the interaction subtly supports users' attention inwards, towards their own body, enriching their sensitivity to, enjoyment and appreciation of their own somatics. This previous work proposes four main qualities that are essential when designing for somaesthetic appreciation. Using ***subtle guidance of attention*** is about designing interactions that actively guide a person's attention, for example towards specific bodily or sensory sensations. A major challenge is to find the balance where the interactive setting guides attention, while avoiding that attention is shifted outwards towards the source of the stimuli, and the surrounding environment. 'Subtle guidance' should be understood as mechanisms that both provide a changing stimuli which helps the shifting of attention between areas or functions of the body, as well as providing support for attention to linger and stay focused, keeping the mind from wandering. Another important quality is to ***provide a space for reflection***. This, on the one hand, is about slowing down the pace of life and actively disrupting everyday habitual routines. It also has a literal meaning: providing a secluded space, forming a certain atmosphere of feeling safe, enclosed, and taken care of. ***Intimate correspondence*** deals with the design and characteristics of feedback loops. For feedback to support in situ somaesthetic appreciation, immediacy and synchronization is key: the 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 feedback and mappings to make sense, these must also correspond with the experience of the bodily aspect being addressed. This quality becomes most obvious when it malfunctions: when the intimate correspondence breaks, for example when a biofeedback is out of sync. Finally, ***articulating the experience*** is an important part of the appreciation process. This is here a twofold issue: supporting the in situ activity of bodily introspection/reflection, while also supporting the posterior externalisation and articulation of the experience.

Sonification of movement and interoception

Sonification of human body processes and activity is a large, and constantly growing body of work, which goes beyond the context of biofeedback we touched upon briefly. It is carried out both with artistic, and with varying degrees of instrumental intent. To name but few examples, Alvin Lucier's "Music for Solo Performer" [21] is an early such work (1965), in which he performed by means of controlling his own brain activity, which was then sonified live through electroencephalographic (EEG) measurement. Elblaus et al. [8] detail three ways in which they incorporate live interactive sonification into modern circus performance. Then there is also of course the enormous body of work on the design and use of new Digital Musical Instruments [22], which has many of the same concerns as interactive sonification for the arts, the distinctions between the two oftentimes being blurred. This is for example the case when musician's ancillary movements – the movements musicians make during performance which normally would not produce sound – are captured using sensors, and mapped to also influence the performance's sonic content [24].

And of course, sonification in the context of biofeedback is today also common, both with therapeutic intent, e.g. towards achieving balance improvement [5], for stroke-rehabilitation [33], as well as with aesthetic intent [17, 30].

A Sonification needs to consider the effects of music

The process of conveying information sonically is termed *sonification*: "*the transformation of data relations into perceived relations in an acoustic signal for the purposes of facilitating communication or interpretation*" [18]. In contrast, while music may also contain information as to the data giving rise to it, music differs in intention: emphasis is on the resulting sound, to be perceived and appraised for aesthetic enjoyment [12], while for sonification aesthetic enjoyment is secondary to transparently reflecting data. The distinction is frequently far from clear: under Edgar Varèse's description of music as "organized sound" [26], sonified data also qualify as music. The distinction is thus based on intentionality, not sonic content. This difference is of particular relevance here, given our conflicting design requirements. Music has such strong effects it is used in purposefully designed therapeutic interventions – it's therefore crucial that any sonic feedback harnesses or avoids music's effects [3].

Few common universals have been found in musical experience, across musical traditions, and these are restricted to very basic elements [23]. Music is shaped from a sequence of musical pitches forming a melody, rhythm being the duration of musical notes and how these are grouped together, while tempo refers to the overall speed of the music. Timbre is a term that defies exact definition, but is loosely described as that which distinguishes one instrument from another, when playing the same score [19]. Note however that a musical piece needn't encompass all of these. Musical narrative is shaped, through fulfilling and suspending culturally learned expectations [31]. Many sets of rules have been formulated for how to shape and interpret a musical narrative. However, such rules share few common elements between times and cultures. What has been found to be universal, are musical behaviours and functions: dance, use in rituals and ceremonies, and music's connection with affect [20]. Music can thus give rise to associations to these functions, irrespective of its content. Little is known on the specific effects derived from varying the different dimensions of music. What has been established, is the correlation between the level of arousal represented primarily through the tempo and volume, and the arousal experienced by listeners [15]. Musical entrainment of volitional movements, for example dance, tapping toes and head-nodding is also well established fact. Some also report on a non-volitional entrainment of autonomic nervous system bio-rhythms [6]. Moreover, reactions to suspending and confirming of expectations can also be physiologically detected [27], mainly the 'chills down the spine' effect, a pleasurable experience associated with increases in arousal and SCR [15], usually evoked by unexpected changes. Chills greatly depend on listeners' previous experience and preferences however. Finally, sound which is predominantly low in frequency is in certain cultures perceived as sad and mournful/soothing, whereas predominantly high spectral envelope energy is perceived as joyful and energetic [19].

Existing interactive systems created for somaesthetic experience

Albeit this research direction is recent, a number of designs have to date been created with the explicitly stated intent of having been informed by somaesthetic theory. We will here introduce only the most relevant of previously existing such systems, and refer interested readers to the additional 18 articles Höök et al. refer to [14] in their review of previous relevant research.

Interactive systems created for somaesthetic experience which also explicitly involve sonic feedback are few. The Slow Floor [10] is a pressure sensitive sound-generating surface, on which dancers perform a slow walk, a design which has stated intents of heightening somatic awareness. It is in the form of six timber and foam interactive walking pads with embedded force sensors connected to a custom-programmed computing device that measures the changing weight of a person walking. This force and weight data is sonified and then reproduced over four speakers surrounding the pad arrangement. The Sonic Cradle [32] describes a sonification feedback system for facilitating mindfulness meditation. In the Sonic Cradle one is in a completely dark room, and interacts with sonification feedback of one's respiration, as measured using a chest-expansion biofeedback system.

The exemplars created during the formulation of the Somaesthetic Appreciation Design principles are of course relevant [14]: the Soma heat carpet, and the breathing light.

The soma heat carpet contains several heat pads, which are used to direct attention to parts of the body when following a pre-defined somatic exercise. The breathing light consists of an enclosure made of fabric and string curtains, lying under which one experiences as being in a room within a room, shutting out the external environment. The enclosure contains a sensor which measures the vertical displacement of the chest, and which controls the intensity and colour of a lamp inside the enclosure, so that it dims and brightens following one's breathing. Our Sarka system has been designed so that it may be used in conjunction with either or both of the above systems.

PROCESS

This research is intended as an Interaction Design (IxD), Research through Design (RtD) contribution [11, 35]. 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. We thus intend to create knowledge about how to design sonifications for somaesthetic appreciation design, through the process of creating Sarka – not devise biofeedback for immediate use in a therapeutic context.

We engaged in Feldenkrais practice once a week for almost two years. Our design ideas grew out of these sessions and were also tested in them, by ourselves. To properly learn a somatic practice, and train your (soma-)aesthetic sensitivities as designers, it is important to be led someone knowledgeable [28]. In our work, we started with a two-day workshop led by Richard Shusterman. After this, our weekly exercises were also led by another trained Feldenkrais practitioner. Note that Feldenkrais is but one of possible practices, and our design explorations should not be seen as only related to this particular body method. In fact, Sarka is not specifically intended to be used with any one existing somatic practice, and would likely be incompatible with all to varying extents, Feldenkrais included. We instead intend to develop exercises specifically for Sarka, in subsequent, dedicated research. Central to our process was the manipulation of sonification and mapping parameters, while continuously interacting with the sonification. Creating connections between source and destination data namespaces - here the sensor data from the Sarka mat, and the control parameters for sound reproduction - is what is referred to as *mapping* [22]. *Mutable mapping* [2, 4] - gradually altering mappings over time, fosters experimentation and was an important component in our process when we explored the mappings and sonification parameters of Sarka. We took to heart the argument put forth by Jonsson et al [16]: when designing interactive systems that involve physical performance, it is crucial that the development process is centred around the setting and practice that is designed for. These, and the practice of implementing and fine-tuning the system being designed, are necessarily best intermeshed into one practice. This is why throughout large part of the development process we worked in pairs, taking turns between experiencing the Sarka mat first-hand, and sitting behind the computer, manipulating mapping and sonification parameters; so that throughout the process, we maintained as close a connection to the experience we designed for as possible.

SARKA

The Sarka mat consists of two wooden sections, under each of which we have attached 8 piezoresistive force sensors. The sections are placed under the hips and shoulders respectively, and are covered by a handcrafted mat with a memory foam core, 2cm thick. The sensor signals are transmitted in real-time to a laptop connected to a low-latency RME Fireface 802 audio interface, transmitting sound either to Genelec 8030 speakers, and/or BeyerDynamic DT 770M headphones. From user movement on the mat, to hearing a reproduced sound, this setup achieves a latency of about 10ms, low enough to be imperceptible for most people. See Figure 2 for an illustration of the speaker, user and mat placement.

Figure 2 - Illustration of the speaker placement in relation to the user and mat (cabling has been omitted in this picture).

Note that before deciding on using the above sensor configuration, we also created prototypes using different

sensor options. We experimented with using a heat camera, as well as a Microsoft Kinect 2 device, before concluding that the necessary sensitivity to detail was best catered for with piezoresistive force sensors.

We have developed two separate software setups. The first requires that a laptop is available, running several software applications, and is for developing new sonifications. The second is a lightweight program which can run on a simple computer/ mobile phone, and is solely for experiencing the feedback. In the development setup, the data from the sensors is processed to calculate the relative pressure on each of the sections, as well as X and Y movement velocity and acceleration, per section. It transmits these values using the Open Sound Control [34] protocol to The Wizard of OSC (TWO) software [1]: a dedicated application for OpenSoundControl (OSC) data manipulation and mapping, created for mutable mapping. TWO is used to create and manipulate the mappings between sensor data and sound synthesis. For sound synthesis, we use the Ableton Live v9 Digital Audio Workstation, as this can be extensively customized using the Max/MSP programming environment. This way we remote control the audio reproduction through OSC messages from TWO. Towards sonification reproduction in the lightweight software, finalized audio is first rendered from Ableton Live. The alternative lightweight software was implemented in the SuperCollider programming language, and gives the same sonification experience as the full development setup.

After considerable experimentation, we arrived the following sonification mappings. The control namespace for each sensor section is relative pressure, X position, and X & Y movement velocity. Relative pressure ranges from 0.0 to 1.0, with both sections having a value of 0.5 when weight is equally distributed between them. X position ranges from 0.0 to 1.0, with 0.5 meaning the user lies in the middle. X & Y velocity are 0.0 when participants are lying still, and approach 1.0 when people are moving. We devised an automatic calibration to counter people's weight and placement variation. Per section, we control two sounds, one corresponding to continuous pressure, and one to momentary movements, meaning each sonification set consists of four sounds. The left-right panning of each is controlled by the corresponding section's X position, while continuous pressure controls the amplitude of its corresponding sound, and the X & Y velocity controls the amplitude of the sound for momentary movement.

Sonifying subtle movement

The sonification feedback is consciously devised for the purposes of raising attention to the following: relative intensity of motions; the presence of motions that may in fact be unconsciously carried out; the relative weight distribution between torso and hips, and between left and right sides of the body. All of these we may be unaware of, and the sonification serves to make these perceptible, so that we may consciously learn to adjust the underlying bodily motions.

Given the many factors we had to take into consideration, we produced approximately twenty different sonifications and variations to mappings, iteratively working through permutations towards the final set of five. Two of the created sonifications contain processed natural recordings, and the other three synthesized sound. Two of the latter, are interesting aesthetic experiences, but are less suitable to the somaesthetic appreciation context. We therefore concentrate our discussion to the first three. Across all three, the spectral envelope was through equalization restricted to a frequency range from 100 to 800Hz for lower sections, and 900Hz to 10.000 KHz for upper. Reverberation was added using the SIR1 convolution effect, to give the impression that the sound was more distant, for all continuous pressure sounds. Momentary motion sounds had nearly no reverberation, to make them appear closer. All field sound recordings were sourced from freesound.org, ensuring their use license permits our using them, and that their recording is of sufficient quality.

The first theme abstractly relates to water. The continuous pressure sound is a recording of rain. For the momentary movement sound, a recording of small, non-regular waves against rocks was used. For the upper section, the sound plays at natural speed, whilst for the lower section, it is transposed down by two octaves. The wave sound's dynamics were compressed to make it more even sounding. The second has the theme of nighttime in nature. The continuous sound for the upper section, is a field recording of crickets and cicadas singing during nighttime in an open landscape. For the lower section, we chose a recording of a moderate wind blowing continuously. For the momentary movement sound, we used a recording of a small campfire. Here too, for the lower section the same sound was used, transposed down by two octaves.

The third sonification used, employs more abstract, and largely sounds. For the upper section's continuous sound, a C1 note is maintained, of a sampled string quartet, the instrument balances having been adjusted to produce a mainly high spectral envelope. For the lower section, the string instruments used are cello and double bass. Both of these, were then replayed through a very distinct, prominent reverberation effect (ValhallaDSP's "Shimmer"), which give the sounds a characteristic otherworldly character, baring little to no resemblance to the natural sounds of string instruments. For momentary movement sounds, unison sinewaves were used, with slight vibrato of a 4Hz rate, chorus and "stereo width" effects. The Upper and Lower sections, correspond to an E2 and G1 pitch respectively, producing a C-major chord when all are sounding. A major chord was chosen to balance that the feedback is not particularly energetic, as it lacks rhythm, and high frequency energy. While not all cultures share the western positive association to major chords, nor do they as far as we know have contrary associations either.

A high-quality video demonstrating these three sonifications in use has been submitted as supplemental material alongside this article.

RELATING TO SOMAESTHETIC APPRECIATION DESIGN QUALITIES, AND TO THE KNOWN EFFECTS OF A SOUND FEEDBACK SIGNAL

To design for ***subtle guidance of attention***, we want the signal to not draw and maintain attention, or be distracting, but it is crucial for it to still be aesthetically pleasing. It should moreover not contain too much detail or embellishment, which does not immediately correspond to body movement, so as to maintain ***intimate correspondence***. We here want people to pay attention to their body, through interoception and proprioception. This means the sonification should not contain abrupt discernible events - unless of course people make sudden movements - but reflect continuous change. Users can thus gradually move their attention between introspecting and the feedback signal, without being prompted by events in the sound. While sound always will exert some influence, we want to avoid strong effects of the sound directly influencing users. So, since rhythmic entrainment is so strong, we avoid rhythms in the sonification. This also means we use continuous tones or continuous sounds only, not musical phrases, arpeggios, or sounds with distinct, periodic, vibrato / tremolo or other modulation. We cannot avoid that the sound is perceived as predominantly relaxing, or arousing, so given the intended use, we aim towards it being relaxing. So, while not all sound should be low, it is of benefit if it nonetheless is more low than high.

The sound timbres used were carefully chosen: on the one hand, synthetic sounds give rise to fewer associations, but they also risk being perceived as threatening, due to their unfamiliar nature. Natural sounds, while giving rise to associations, are likely more easily perceived as calm, if the association made with them is non-threatening. A difficulty here is to balance all the above factors. Modern atonal music and serialist composition, is often used in film soundtracks to give rise to an unsettling feeling [26]. In our avoidance of clear rhythm, clear events, and immediately discernible harmonies, we also risk achieving the same, making for a difficult balance to strike.

Towards ***providing a space for reflection,*** it also makes sense to create an auditory environment different to the actual room, striking a balance between realism and abstraction – after all, we do not want telepresence through sound either. We experimented with speaker placement, and whether to use headphones, with this quality in mind. We found that placing speakers directly to the left and right of the head, gives an effect of being unobtrusively separated from the sonic environment of the room, enveloping the user with the sounds from the sonification, while still maintaining physical comfort through not wearing headphones.

All of the above, were arrived at through collaboratively iterating through design changes, working in pairs, with one member of the team lying on the mat, while the other manipulates the mappings and sonification parameters following what the member lying down ***articulates from the current experience.*** We conducted several such sessions, ensuring that we had ample of time, and that both team members were equally aware both of how the experience is of lying on the mat, and what choices were technically made in the mapping and sonification. Interestingly, the experience of lying down, is vastly different to listening as an observer. This stresses the importance of ***intimate correspondence:*** while as an observer the sonified spectacle is rather odd, and not always pleasing, it is nonetheless a fulfilling experience for the person lying down.

EVALUATION

As discussed previously, Sarka's design has been informed through continuous iteration, where feedback from somatic connoisseurs has been involved throughout, both through their training us in their practice (in this case Feldenkrais), and in giving continuous feedback on the ideas and designs throughout the process. We have thus not designed a system, and then sought the feedback of experts after the artefact is designed, but have instead to a great extent followed a process of continuous evaluation and refinement. We have, moreover, involved all our colleagues who also practice Feldenkrais with us (a group of six people in total), to give us feedback during various stages of this iterative refinement of the mat. This process is after all what is argued to be necessary in a somaesthetic appreciation design process.

As mention previously, Sarka was not created for use with any specific existing somatic practice in mind, even though its design is strongly influenced by such practices. Instead, we will in a dedicated effort, devise exercises specifically for Sarka. For this reason, we have also not at this stage conducted a more formal evaluation of Sarka when used with existing practices, as this would only point to certain incompatibilities which we already are well aware of. This need not mean that Sarka's design is faulty, only that it is best suited for a particular kind of excercises, a subset of the very wide range of exercises within any one of the many somatic practices.

Following the completion of the Sarka mat, we took part in a two-day audio-visual art festival, open to the general public. During those two days, approximately 150-200 members of the public had a chance to test the mat, and discuss their experience with us. Another 400-500 saw it, many of whom talked to us about it, but we will not include their feedback, since they did not experience the mat first-hand. While this was done under far from carefully controlled conditions, we nonetheless did treat it as an opportunity to elicit feedback on what people thought of our prototype.

A theme that repeatedly appeared in the discussions, was that when they were waiting to try the mat, they watched other people's experience of it, and heard the results from the speakers, building up expectations of what it would be like

to use it. When they finally did use it however, they were surprised by how different the experience was to their expectation – that it was actually less stressful than it appeared, and that the congruent experience of interrelating sound an motion, was more enveloping than imagined, detaching them from their surroundings.

Another set common remarks, were from people who themselves regularly carried out some form out of somatic practice. Yoga practitioners were quite frequent, and the comment was common that they could very well imagine themselves having sonic feedback, analogous to that from the mat, in their yoga practice. On two separate occasions, people who frequently exercise using gym equipment, said that they strongly imagined themselves using something like the mat while working out, to the point where, when they mentioned this, we invited them to lie back down and try using it with that mind-set, doing for example leg exercises, sit-ups and push-ups. Two others were Feldenkrais practitioners, and to our surprise and satisfaction, they spontaneously mentioned that they could very well imagine using the mat while practicing, without our having first mentioned any such intention behind the design. One concern was however put to the fore by one of practitioners, as to what extent the audio feedback might interfere with rather than reinforce the perception of the body.

CONCLUSIONS AND FUTURE WORK

We have, in our exploration thus far, found that use of sonification for somatic appreciation practices shows promise. Especially for raising the awareness of and directing the attention to small bodily movements that we normally are not conscious of. We now intend to continue with the next intended phase, of using Sarka with end users and with exercises of our own design, inspired by Feldenkrais, but specifically intended to be carried out alongside continuous sonification. Given these exercises we will further refine the exercises and mat, towards a study on how such an exercise may benefit from being used in combination with sonic feedback.

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