Wearable Choreographer: Designing Soft-Robotics for Dance Practice

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ABSTRACT
In this pictorial, we describe an auto-biographical design process that led to the fabrication of a soft robotic wearable for lower limb movement guidance that we designated Wearable Choreographer. We first explored the design from a first-person perspective and then shared it with four dancers. Our experiments illustrate how the wearable both constrains and inspires the dancers towards new ways of performing, challenging them to rethink their movements. Our design inquiry contributes with reflections on soft robotics that uncover the challenges and prospects designers and researchers in Human-Computer Interaction face when designing, prototyping and experimenting with such technologies for embodied interactions.

Author Keywords
wearables, soft robotics, soma design, dance, autobiographical design

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INTRODUCTION
Choreography, from the Greek words "χορεία" (circular dance) and "γραφή" (writing), is the art or the practice of composing sequences of dance movement and instructing dancers to them. This often consists of guiding dancers through words or touch. Such a practice inspired us to explore soft robotics [61] to provide movement guidance through touch with the goal of choreographing dancers. Soft-robotics, built from soft materials and often inspired by living organisms, are flexible malleable material systems that can adapt to their surroundings. Given their safety and shape compliance, manipulating and guiding the human body has emerged as a compelling application of this technology. Building on previous works combining dance with exoskeleton technologies [10,44], we designed an embodied wearable soft robot for dance practice using an auto-biographical first person approach. More precisely, we built a wearable device, which we called Wearable Choreographer, that actuates on the leg in order to prompt movement. Our design is meant to generate a sensory interaction that choreographs the dancer by inspiring, disrupting, enriching and inviting kinaesthetic creativity into their practice. In this pictorial, we describe our auto-biographical design process, careful to narrate the design iterations that we performed and to include our (mainly the first author's) personal experiences of building and testing the prototypes. We also report on the results of an experiment where we shared our final design with four dancers and gained knowledge on how they interacted with our soft robotic system. Finally, we discuss the opportunities and challenges of soft robotics to provide embodied wearable interactions for dance practice and performance.

RELATED WORK
Integrating wearable technologies into our everyday life has become increasingly popular within the Human-Computer Interaction (HCI) field [5,40]. Whether a given technology eventually aids, constricts or completely transforms a certain activity is a question that is explored through a multitude of experiments and user studies. Irrespective of the end result, findings arising from these experiences often inform us on how to better design embodied interactions [19].They also provide us with new insights on how to integrate certain technologies in different contexts and reveal individuals' propensity to wear it in their activities.

Systems for Supporting Dance Practise
When looking into technologies used for dance training and practice, dancers often resort to video to learn and train specific techniques or repertoires [59]. Different

approaches have been explored towards enhancing dance training through capturing and influencing dancers' movements [52]. These approaches often offer on-screen visuals that interact with the movement of the body [36,54], while having users respond to such visualizations [29,42], inevitably influencing their movement. Other systems for supporting dance training allow users to segment and analyze different movement sequences [13,30,54] providing them with an analytical and reflexive overview of their creative practice. Finally, there are tools supporting dance practice that provide performance feedback to the dancer meant to correct their performance [21,60]. While most of these designs generate useful visual and timing cues, mere video recordings or screen-based interactions might not inform on the inner movement qualities nor the kinaesthetic sensations in dance, making it an incomplete knowledge transfer mechanism. Indeed, dance practice relies on cultivating embodied sensations and experiences which are difficult to transmit visually [3,16]. Despite the diversity of dancers' embodied experiences, the literature in the field of HCI focuses mostly on providing screen and audio based technologies to support kinesthetic awareness and creativity in dance [14,25,65]. Further haptic and physical interactions between dancers and digital artifacts remain scarce [11].

Lately, there has been increased interest in going further than the screen-based interactions, instead focusing on embodied and wearable experiences [6]. Along that path came new approaches to probe the dance practice with external agents. Oskar Schlemmer, the creator of the triadic ballet costumes in the Bauhaus movement [45], pioneered an embodied approach to influencing dance. Along that path, studies have focused on an array of embodied dancer-computer interactions, namely the interaction of dancers with external automated objects [26] or the use of wearable technology that both acquires and prompts one's movement [28,32,33,43].

Moreover, combining haptic technology with the immersive qualities of mixed reality has been shown to provide effective directional cues [35,53].

Findings from all these studies are few and far-apart but have already given us a promising scope of experiments that suggest that integrating haptic physical and wearable technologies into dance can inspire dance practice [4,74]. However, these experimentations also revealed how such technologies applied to creative contexts, such as dance, can be disruptive and can create tensions due to their lack of robustness in a studio setting, which can end up hindering dancers' practice [28].

From Rigid Prosthetics to Soft Robotics

Due to its flexibility, lightness and adaptability, it was not long until soft-robotics became part of the toolkit to create wearable interactions. Different kinds of actuation have been explored and while inflation remains the most common, other triggers have been studied [63,72] and their applications continue to grow at an impressive rate [68]. One widely explored kind of soft robotic structure is the McKibben muscle, a longitudinal muscle composed of a chamber of air wrapped in an expandable outer mesh which contracts in length when actuated [27].

Exploring the versatility of the linear geometry found in McKibben muscles, research has been conducted on the effects of braiding [46,49,50], weaving or knitting [2,12,37,46,55,62] McKibben embedded garments, providing a potential seamless integration [2]. These experiments aimed at comparing output forces and novel shapes [46]. Although there have been many attempts to make an upper-limb garment that controls either a human arm [1,15,70,76] or hand [12,24,48,66,75], there have been comparatively fewer ones aiming to control either the full body [9] or simply the lower limbs [47,51].

The majority of applications for these technologies have also been, as its origin would suggest, in the field of motor rehabilitation and assistive technology [68], but fewer have been applied in a dance context [46,67].

Our study explores the design of soft robotics that acts as a choreographer guiding dancers in their practice. This is a novel application of said technology bringing forth new opportunities for implementing wearables into embodied creative practices.

DESIGN METHODS

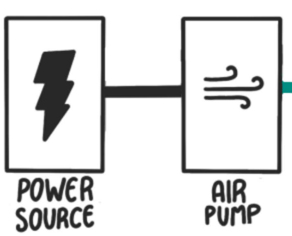
Our design process is auto-biographical [56] and makes an explicit use of the first author's personal dance practice in the design of the prototype at every iteration of the work. The first author has over 10 years of experience in dance, particularly in swing dances, both solo and with a partner, as well as tap dancing.

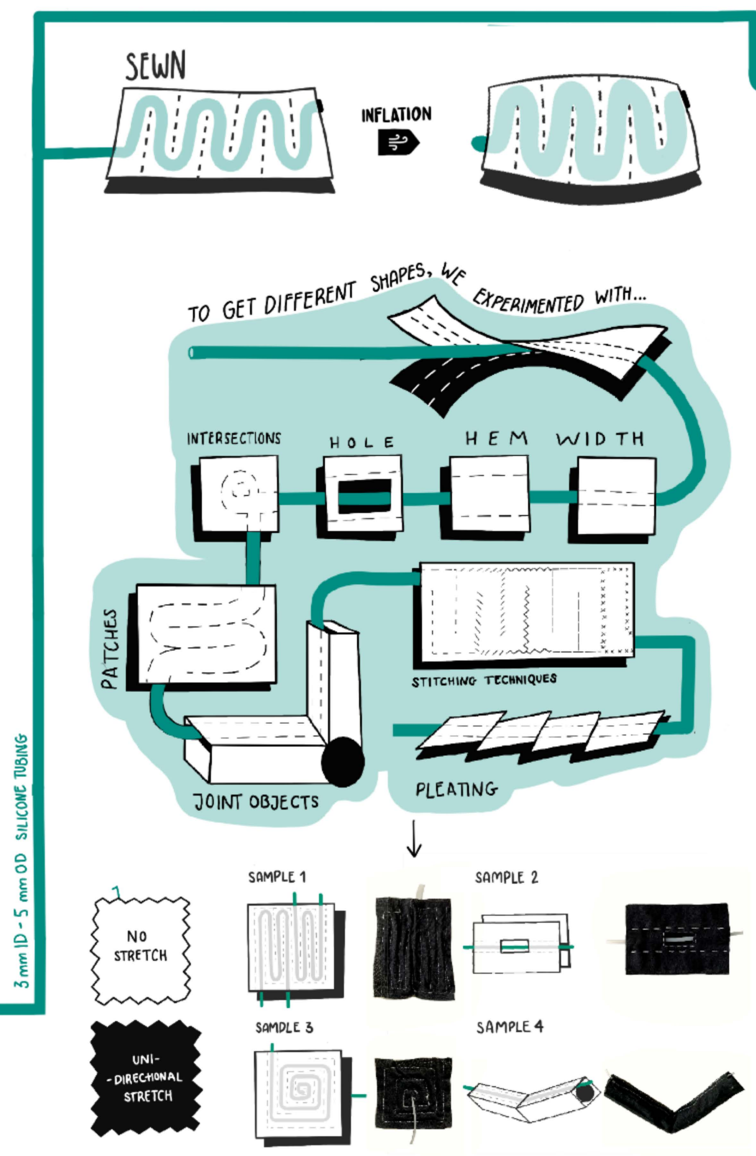
We are also committed to research through design methods [77]. Throughout our process, learnings were made from the making. We documented and reflected on how the different versions of the design provided different experiences with a critical look at our design choices and experiments. We implemented the learnings onto newer design iterations and concepts using the technology at hand [39,56]. Finally, we are also committed to a somaesthetic design approach [38,40], an experiential design method centered on the soma (or the living sensing body). We pay acute attention to the nuances of our (mainly the first author's) lived felt embodied sensorial experiences in our design [38].

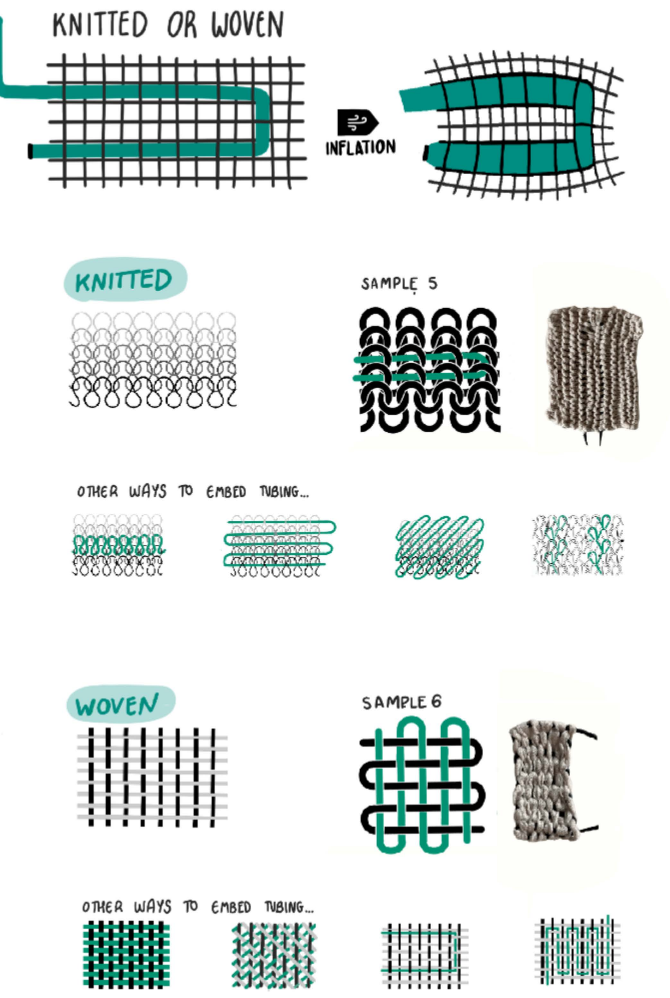
DESIGN PROCESS

Playing with Soft Robotics

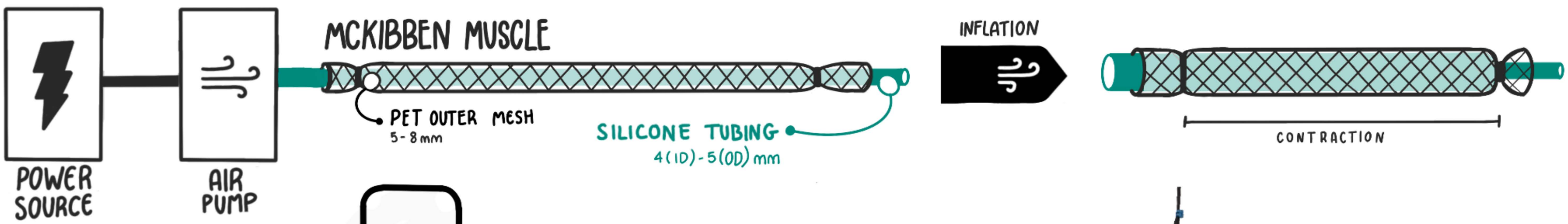
After learning about the different types of soft robotic applications, I (first author) was interested in embedding a soft robotic system within a wearable garment. To do so, I decided to focus on fiber-reinforced pneumatic actuators, commonly composed by an air chamber within a malleable material such as silicone or latex, enclosed in a flexible fiber layer. I produced three different kinds of fiber reinforced samples: McKibben muscles, Sewn and Knitted/Woven. I started with sewn samples in which I embedded silicone tubing with 3mm inner diameter (ID) and 5mm outer diameter (OD) between two layers of textile. In theory, when inflated with air, the tubing either expands in diameter and contracts in length, or adversely only elongates in length, accommodating to whatever space has been created by the stitches surrounding it. Next I made use of the woven properties of the textiles, hypothesising how the fabrics' flexibility and the differences between knitted and woven materials could influence different results.

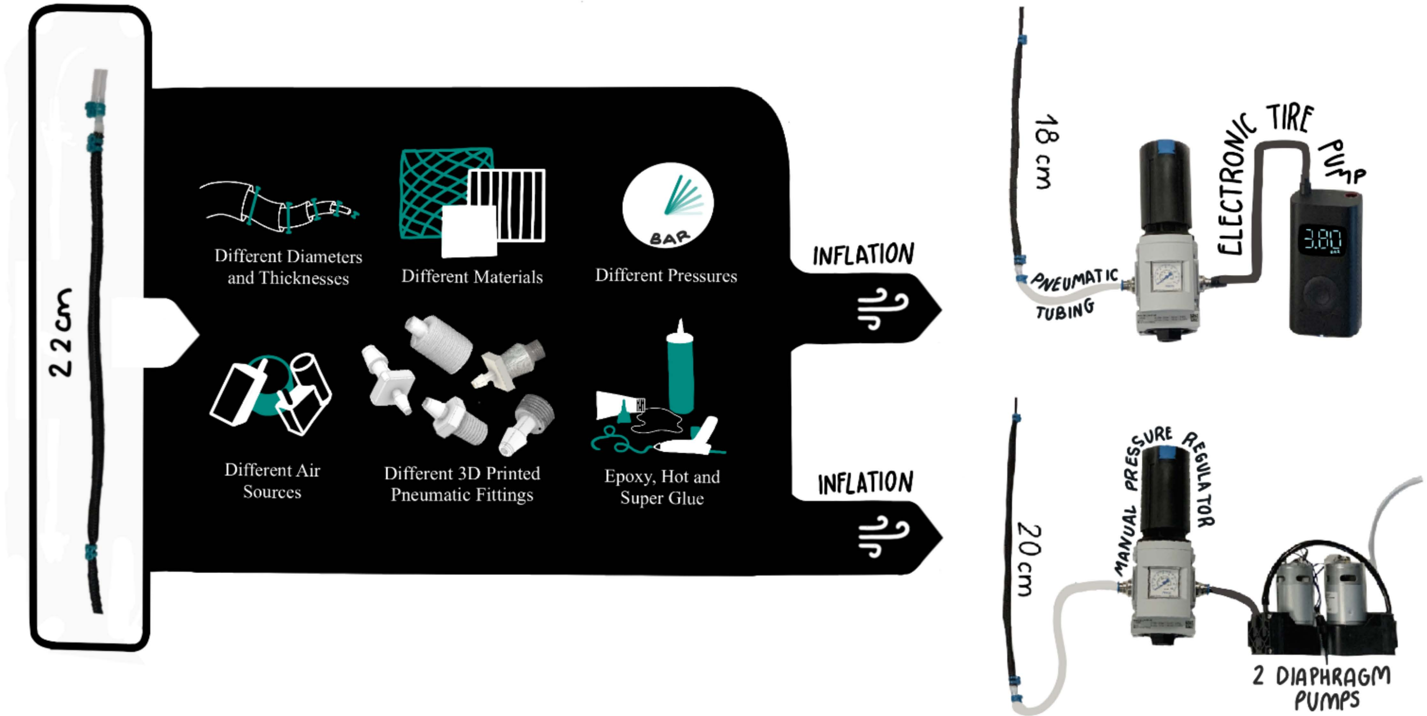




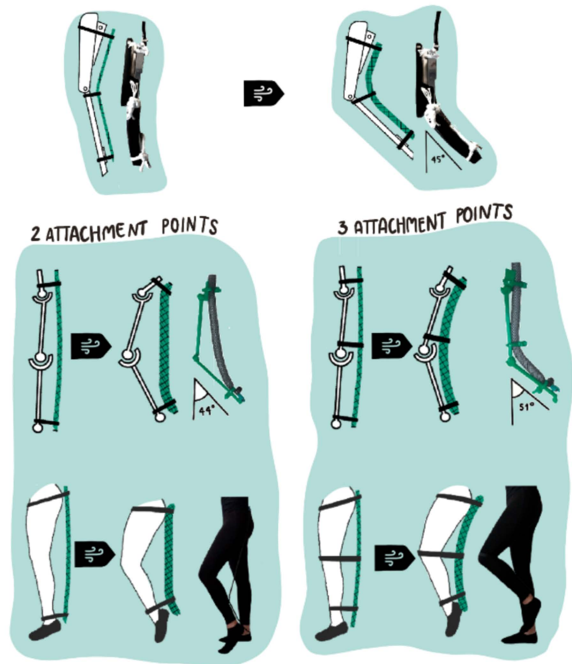


Embedding a fragile silicone tubing using thread proved to be a challenge, since many samples were deemed unusable after the silicone was ruptured or punctured and no samples were able to be inflated due to major leaks and recurring damage in the tubing when inflated.





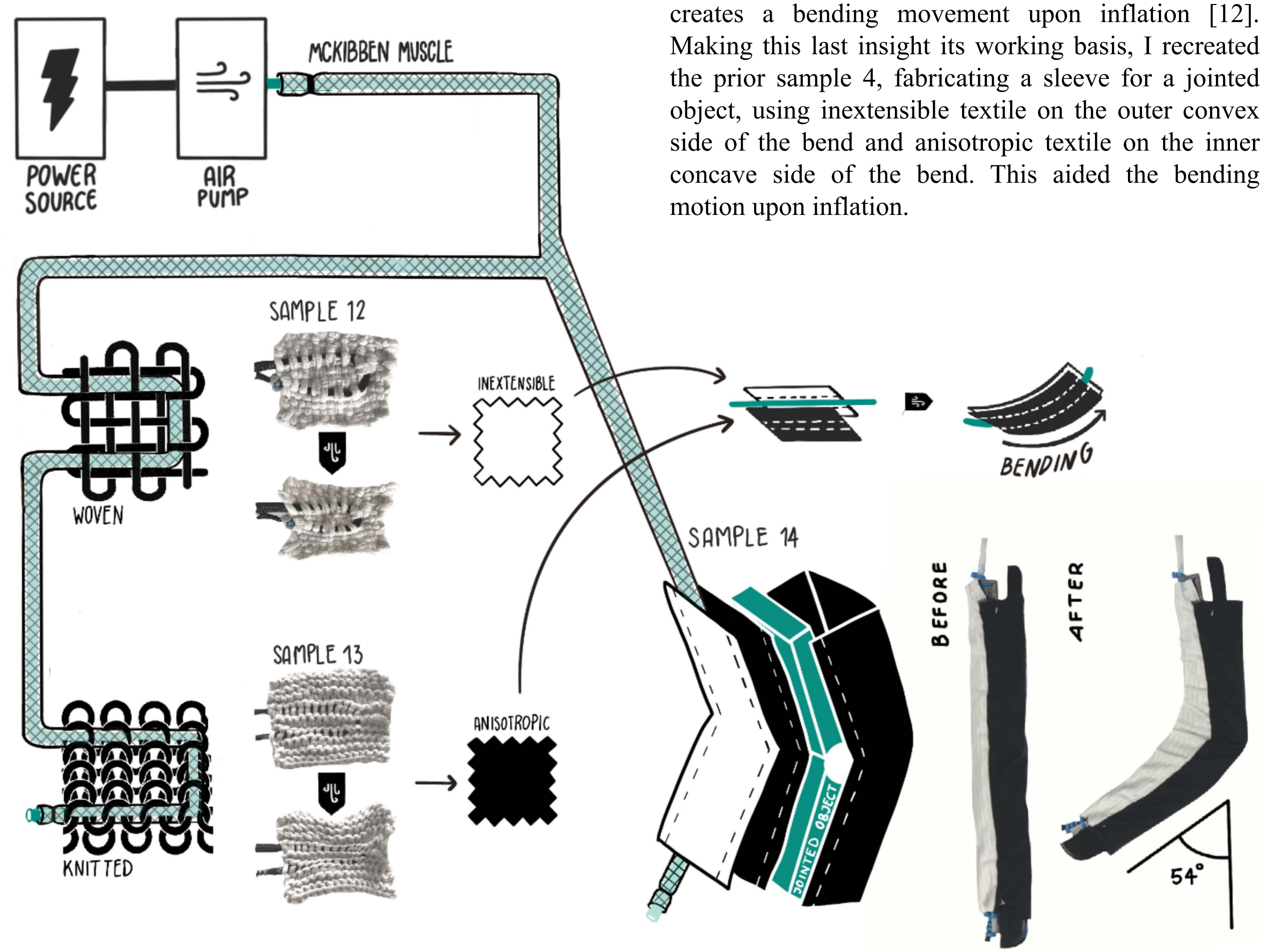
Next I moved on to McKibben muscles which are made of hollow silicone tubing enclosed in an outer mesh of interlocked expandable filaments. Once they are inflated, they quickly contract in length and are capable of nearly instant and high contraction forces [18,46]. The smaller the difference in the diameter between the tubing and the outer mesh, the bigger the contraction ratio. To achieve contraction upon inflation, I set different parameters through an extensive number of iterations in order to minimize leakage and understand our specific pressure requirements. This took up the majority of the design process timeline. For the inner tubing, I experimented with latex and silicone and chose for my final muscle 0.5 mm thick and 5 mm wide silicone tubing. For the expandable mesh, I used PET based, 5-8 mm, expandable tubular braid. I 3D printed different pneumatic fittings but eventually used purchased straight reducers. To ensure minimum leakage at the intersection points between the fittings and the tubing, I tested zip locks, knotted string and a number of reinforcing adhesives (hot glue, liquid silicone and epoxy). I chose to use zip locks which were then sealed in place with epoxy. Once the leakage issues were minimized to a point where the muscle was able to inflate, I connected it, firstly to two 12V miniaturized diaphragm pumps (capable of 3 bars when serially assembled and 2.4 bars in parallel). Later, I also tested the same device using one electronic tire pump (capable up to 11 bars, set at 3.8 bars as a minimum for inflation). From its original length of 22 cm, the muscle contracted down to 18 cm using the electronic tire pump, and to 20 cm with the two diaphragm pumps. All of these choices around materials, sizes and air sources were made to achieve a satisfactory trade-off between achieving inflation at the lowest required pressure while also having a high enough force output for our requirements.



Furthermore, by adding mechanical restrictions the final shape and movement of the muscle can be influenced [46]. I simulated this by attaching it to an everyday jointed structure, a stapler, which resulted in a bending motion upon inflation. Following that, I attached the muscle to a 3D printed ball joint structure, and then to my own leg. For these two last experiments I simulated the exercise comparing 2 or 3 attachment points to gather insights on achieved angles, force output, and comfort. In both of them, using three attachment points provided better results: the 3D printed object had a 7° higher contraction angle and helped me perceive the wearable's action throughout my entire leg, giving me a higher sense of connection and directionality. This later on served as the functioning basis for the final wearable.

Considering the lack of success avoiding leakages in fabrications before the McKibben muscles, I recreated the earlier woven and knitted samples 5 and 6, substituting the silicone tubing I had used for a McKibben Muscle. With this new approach, the samples finally inflated, deforming the shape of the sample as desired.

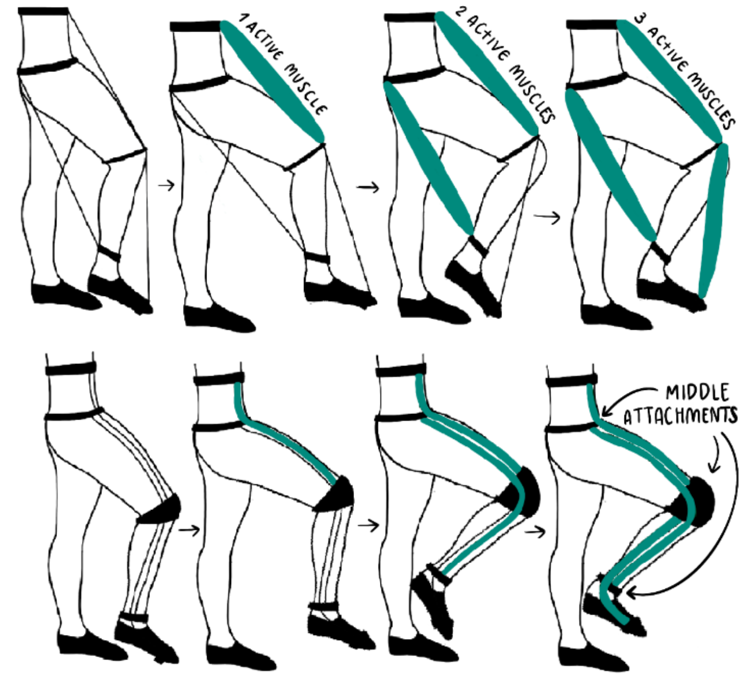
Working with both knitting and weaving led me to confirm how knitted textiles allow for unidirectional stretch (anisotropic textiles) while woven textiles do not allow for stretch in any direction (inextensible textiles) [58]. Making use of their different stretchability characteristics, we can play with textiles to influence the end shape of silicone tubing inlaid between textiles. More specifically, combining an anisotropic stretch textile with an inextensible textile creates a bending movement upon inflation [12]. Making this last insight its working basis, I recreated the prior sample 4, fabricating a sleeve for a jointed object, using inextensible textile on the outer convex side of the bend and anisotropic textile on the inner concave side of the bend. This aided the bending motion upon inflation.

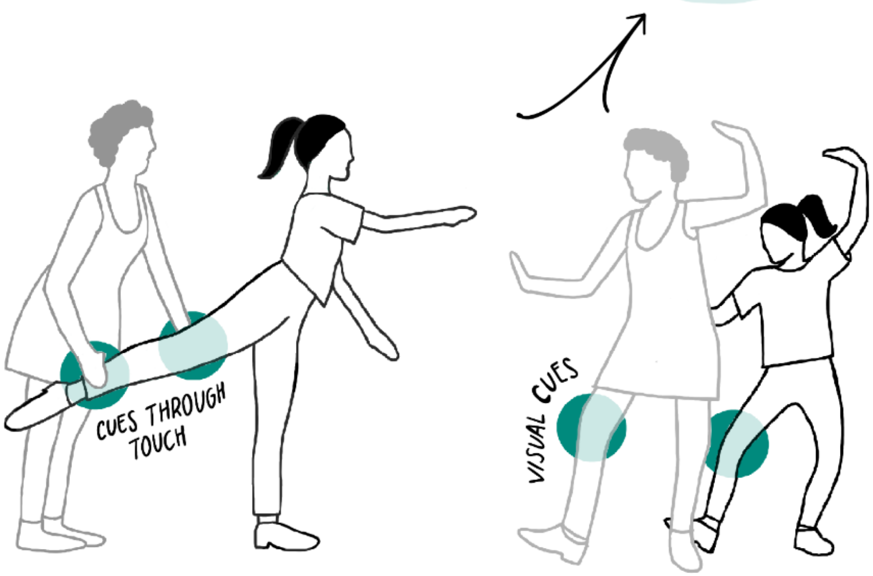


Arriving at the Concept of “Wearable Choreographer”

As a dancer myself, I saw a great potential in movement prompting technologies. After getting to understand both the potential and limitations of soft robotics, I chose to design a prototype that provides **movement cues as guidance in the dance practice** - essentially embedding a choreographer into one’s own modified garment.

To understand the best body actuation points, where a soft robotic system could provide guidance, I carried out multiple ‘Wizard of Oz’ [19] experiments mimicking the effect of McKibben muscles. I did so by attaching strings to different parts of my body and pulling on them to help me understand what kind of movement or sensation they might evoke when contracted, just like a McKibben muscle would when inflated.



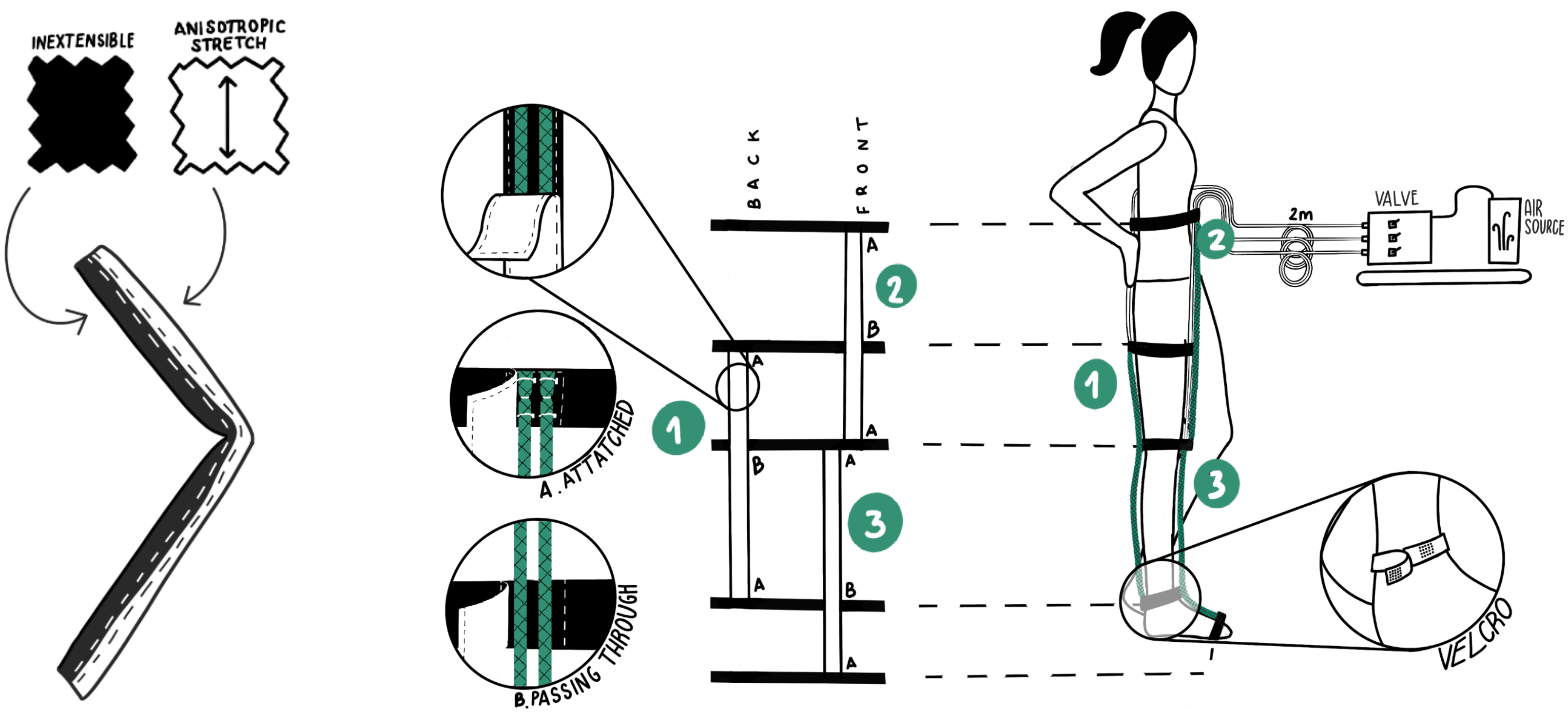


Having in mind both the context I aimed to design for, as well as my own dance training in swing and tap dancing largely focused on footwork, I decided to create a wearable that could give me timing and movement cues through actuation on my leg. Based on earlier experiments with McKibben muscles on legged locomotion [41], as well my own previous experiments using McKibben on jointed objects, I created two different designs: one where muscles ran along my leg and another one where they acted similarly to puppet strings. The aim of these muscle structures is to lightly prompt the leg to bend, potentially providing guidance in both tempo and spatial orientation. To complement the insights I gathered from the experiments I made earlier placing a McKibben muscle on the back of my leg, I fabricated 2 long muscles. I attached one anteriorly, connecting the knee and the hip and another one posteriorly, connecting the hip and the ankle. I then actuated them with and without a middle attachment, which made them run along the leg, simulating each of the design alternatives. Similarly to the earlier experiment using only one muscle, I felt a stronger, more generalized input by using three attachment points.

Assembling the Wearable

To assemble this wearable, I started by fabricating from the outset three almost identical double muscle bundles (1, 2 and 3 in the illustration). These muscles were identical to the previous ones except they were connected to the air source tubing using a Y shaped pneumatic fitting. I connected the bundles to each other and to my body in an adjustable exoskeleton structure made of four textile bands that attach around the leg using velcro, going on top or below clothing that can adjust for anatomical features highly variable between users. The muscles are each attached to the bands in their start and end points using ziplocks sewn into the band. Between these two attachments, each muscle goes through an additional eyelet in another band to keep it running tight along the leg. The muscle is not attached to it in order to allow for height adjustment and maximum contraction. The bundles were strategically placed so that each one prompts a different joint in the leg to bend when inflated: the hip, the knee and the ankle. The choice to go for double muscle bundles (consisting of two parallel identical McKibben muscles powered by one single air source each) was a result of experimentation and came as a compromise between a higher force acquirement and bulkiness. Each muscle bundle was inflated through long pneumatic tubing connected to an air source to allow for a high range of motion.

I covered the bundles in a two layer textile interface using anisotropic stretch textile and inextendible textile on the concave and on the convex side of each side, respectively, simulating the results from sample 12, to aid the bending moment. Even though through my tests and iterations I could not find significant evidence of this bending aid effect, I decided to incorporate them regardless as I realized they also added a sense of mystery and simplicity to the garment. Embedding McKibben muscles directly within the weave of the textiles was not implemented in this final design given the goal of size adaptability for different dancers, made harder through a knitted or woven garment, as well as simplicity of fabrication and replicability.



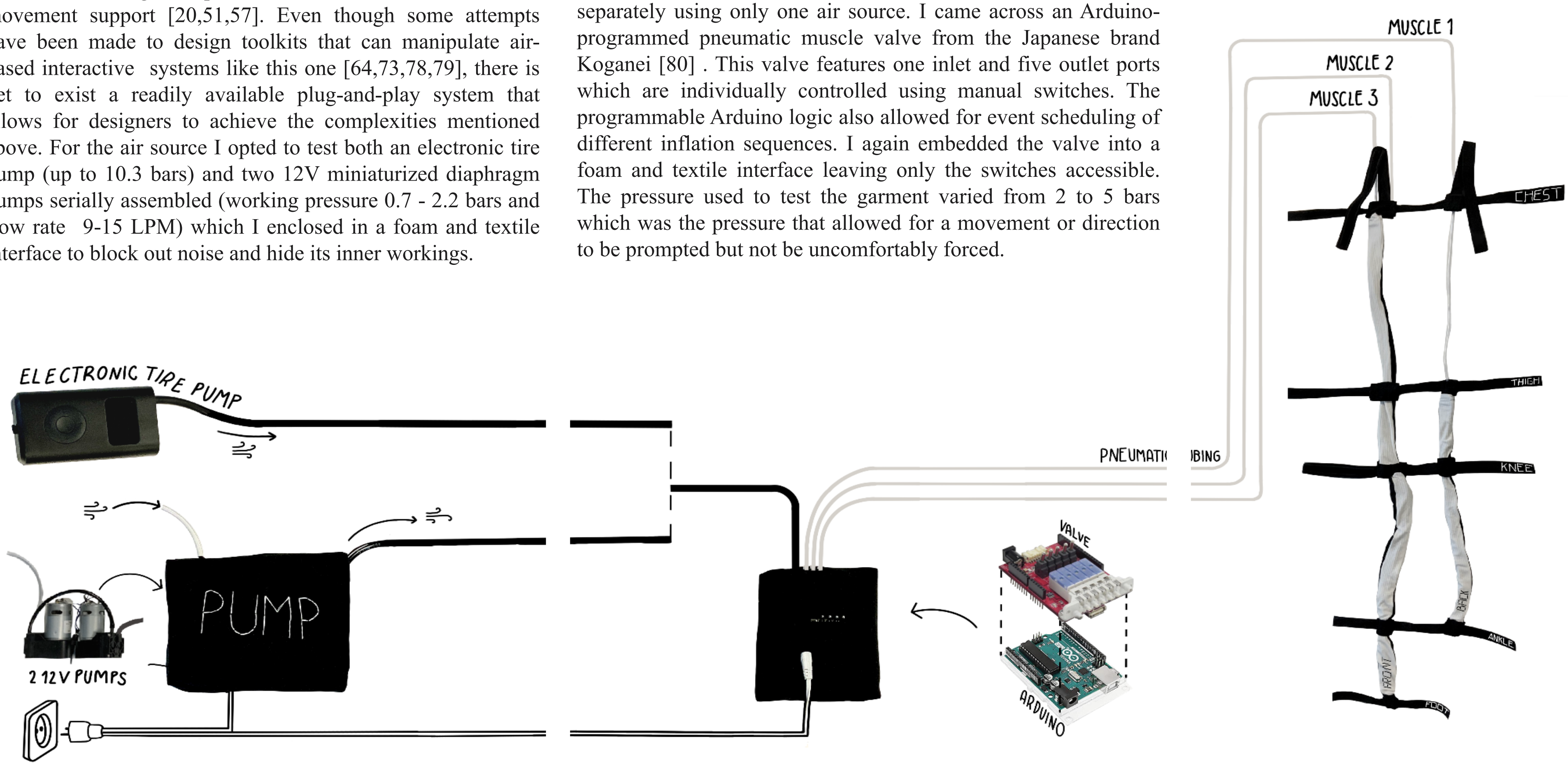
Inflating the Wearable

In order to trigger inflation and deflation in multiple muscles at any desired order and timing, a pneumatic control system is needed. Such a system includes an air source, as well as a valve that can orchestrate the inflation and deflation of the three different muscles at variable points in time. Both the air source and the valve need to be capable of enough pressure to inflate the muscles. In our case, the minimum pressure required to inflate the muscles is around 4 bars. I arrived at this number through our iterative experiments but also based on earlier findings on pneumatic actuation for lower limb movement support [20,51,57]. Even though some attempts have been made to design toolkits that can manipulate air-based interactive systems like this one [64,73,78,79], there is yet to exist a readily available plug-and-play system that allows for designers to achieve the complexities mentioned above. For the air source I opted to test both an electronic tire pump (up to 10.3 bars) and two 12V miniaturized diaphragm pumps serially assembled (working pressure 0.7 - 2.2 bars and flow rate 9-15 LPM) which I enclosed in a foam and textile interface to block out noise and hide its inner workings.

Even though the foam case of the miniaturized pump diminished its noise greatly, its pressure was still significantly lower compared to the electronic tire pump. It also did not allow for much control over the output pressure nor any intentional variation to it. This meant that no variation in the force output would be possible which I had planned to explore later and observe the dancers' reactions.

I initially used an Arduino-based valve system to inflate and deflate one single muscle [69] and moved on to search for a solution that would allow inflating three individual muscles separately using only one air source. I came across an Arduino-programmed pneumatic muscle valve from the Japanese brand Koganei [80] . This valve features one inlet and five outlet ports which are individually controlled using manual switches. The programmable Arduino logic also allowed for event scheduling of different inflation sequences. I again embedded the valve into a foam and textile interface leaving only the switches accessible. The pressure used to test the garment varied from 2 to 5 bars which was the pressure that allowed for a movement or direction to be prompted but not be uncomfortably forced.

Because of their weight, neither the valve nor the air pump are meant to be worn on the body. Instead, they rest on the table but are connected to the wearable through 2 meters long light tubes, allowing for some movement freedom. This design choice also allowed us to control the valve and observe the reaction of the dancers when sharing the wearable with them.

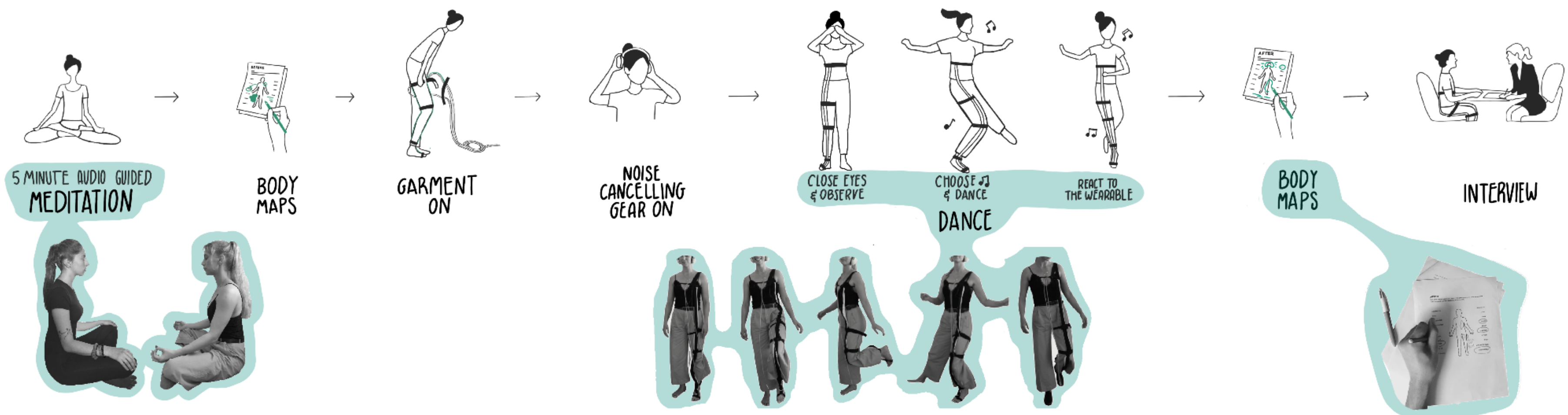


SHARING THE WEARABLE

After our auto-biographical design of a wearable soft robot for dance, we chose to share it with four dancers in order to gather insights on how the wearable supports their practice.

Participants

These dancers were recruited within the first author's dance community to experiment the wearable. They all had medium-to-advanced dancing experience ranging from 4 to 15 years mainly in swing and tap dancing. They had no previous experience with wearable technologies in dance.



Procedure

The whole experiment took between 30 and 45 minutes in a room in the lab. Both the designer (first author) and each participant went through it together which helped create trust and familiarity. The participants were asked to resort to the think-aloud method as they went through different parts of the experiment. Given the garment's subtle action, we created a pre-usage short meditation routine to help participants slow down and bring focus on breathing and to different body parts at a time. Additionally, we asked the participants to document their embodied state through body maps [17] both before and after dancing with the garment. From a number of words in the body maps, they were asked to circle the ones they identified with and to draw or write whatever else came to them as they perused through their bodily sensations. These words were chosen using inspiration from previous work [69] and having in mind a multitude of bodily sensations. They included the words "asymmetric", "nauseous", "tired", "light", "challenged", "pain", "manipulated", "small", "big", "surprised", "soft", "jittery", "vibration", "stiff", "moved", "balanced", "unbalanced", "uncomfortable" and "comfortable". Along with the meditation, this helped heighten their attention to their physical sensations and enter an introspective state. The dancers used noise canceling earphones and mufflers to not be too disturbed by the extremely loud sound of the air pumps. Finally, we walked the participants through three consecutive activities, each lasting around 2 minutes, where they danced with the wearable. First, we asked them to close their eyes and simply try and observe whatever they might feel in their body as the garment is activated. For the second activity, we asked them to select a music of their choice and dance to it while still sharing out loud their perceived bodily feelings. In the third and last activity, we asked the dancers to dance with music while being mindful of the garment's actuation points and react to them intuitively. Following dancing, the participants answered questions about how using the garment affected their dancing and whether they would include such technologies in their own practice.

Data Collection and Analysis

We recorded video and audio of the entire experiment, took personal notes and collected the body maps. We transcribed all materials and analyzed it thematically [7,34], in order to find patterns that capture how the participants experienced the wearable and how the wearable affected their movements and embodied state.

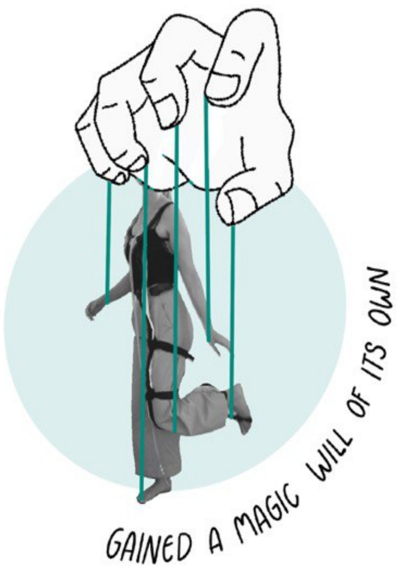
RESULTS

Our results organize around three key insights on how the garment choreographed dancers. Firstly, the dancers felt that the garment **restricted and changed their movements**. They felt their movements restricted, imposing a smaller range of motion. When the wearable "pulled" them in a certain direction, it was uncomfortable not to move or to try to contradict it. At times they felt frozen in asymmetrical positions when trying to interpret input coming from one single leg. Another concern shared among the dancers was the fear to damage or step on the wearable cables, inherently discouraging too spontaneous or hasty movements. On the other hand, when the dancers did move too much, they often could not discern any input, hence received no prompt. For one dancer, the loud sound of the pump and all the consequently necessary noise canceling gear was exceptionally distracting which rendered the experience unpleasant. Overall, the garment's limitations brought frustration to the participants when they noticed things such as its loudness, its inaccuracy, its speed or the physical boundaries that it placed on their range of motion.

Following the effect of restriction came a more appealing aftermath: the garment **inspired creativity and new sensations**. The dancers' usual dance movements now did not feel as natural so they had to come up with new creative patterns and ways to express themselves through movements. Exploring this while simultaneously trying to react intuitively to the wearable unpredictable prompts made the dancers realize they had to be present and heighten their attention to their bodily sensations.

They often laughed as they went through the process of reimagining their movements. The tap dancers especially found it amusing to try and come up with different interpretations for every actuation sequence to produce different tap rhythms. All dancers described the experience as fun, new and interesting and showed interest in adding movement-prompting wearables to their dance practice in the future. They also came up with different creative solutions around improving the wearable´s integration as a choreographer into their individual practices.

Motivating the newfound creativity in these dancers was their own perception of **the garment as having a mystic will of its own**. Through the dancer's narrative of the experience, the garment gained the role of a choreographer wanting to challenge them into producing a specific movement. The perceived agency given to the wearable was also illustrated by one dancer who felt that the wearable was tickling her. Even though the actuation was equally random both between activities and between users, each dancer developed multiple theories on how the wearable reacted differently to different body movements or followed a different pattern in each activity. After dancing with the garment, multiple dancers circled the words "surprised", "manipulated" and "challenged" to describe their mood. Moreover, descriptions in the interviews often hinted towards bodily manipulation and a feeling of otherness. This illustrates how they perceive the wearable as a choreographer acting (and sometimes constraining) on their body with specific directions that led them to perform in new ways.



DISCUSSION

As foreseen, our design inquiry sheds light simultaneously on the promising future opportunities of soft robotics in the dance practice as well as on the challenges it still presents.

Opportunities of Designing Soft Robotics for Dance

Our design highlighted how soft robotics can influence, restrict and inspire dancers. Our experiment put the participants in a novel situation where different involuntary movements in one of their legs constricted the movements they would naturally follow. This challenged them into a place where creativity was an essential tool to dance with the wearable choreographer. While no user considered the overall experience uncomfortable, moments of discomfort brought novelty and unpredictability to their movements.

Our results also show how the participants viewed the wearable as an entity with agency. They considered the garment as a choreographer capable of transmitting complex instructions that they can go along with or against. The mysteriousness of its inner workings and its unpredictable actions provided the dancers with a newfound thrill as they navigated a novel movement guiding tool. Our results also show how using a wearable robot pushes the dancers to focus on an instruction provided by a bodily sensation. This made them heighten their focus to their soma while moving. Going through meditation and the filling out of body maps before an initial activity also aided the process of looking inwards.

These results are to be seen in light of the fact that dancers were experimenting the system in a research environment outside of their usual place of practice. It is likely that the setup had an effect on their dancing as well as their perception of the expectations placed on them [31]. All this considered, all users were excited about the promising integration of robotics soft wearable technologies in their practice to support their kinaesthetic creativity.

Challenges of Designing Soft Robotics for Dance

In any research using novel technology, arguably one of the biggest contributions to be made is an extensive exploration of the capacities, opportunities and challenges that such technology brings. This is particularly true in the field of HCI, where designers often must weigh in different technologies to incorporate in their designs. Moreover, in an academic setting, different deadlines and expectations depending on a project's context highlight the need for feasible results and an adequate skillset found in the researcher carrying it out.

Although soft robotics research has yielded extraordinarily promising results coming from people with varied backgrounds, one cannot go without highlighting the difficulties and frustrations that working with it can bring. In this particular project a number of challenges arose which molded the design iteration process, the end design and the motivation of every party involved.

While this project was aimed at being approached from a somaesthetic perspective, in which learnings are made from bodily sensations, the initial barrier to having a piece of working technology which can be applied on the body made it extremely difficult to focus on somatic events. In a way, one can say that this technology, with such promising embodied applications, can disembody the researcher throughout the design process as a substantial amount of the focus during design, development and fabrication relies on out-of-body intrinsicate and delicate technical experiments using materials.

When designing pneumatic systems with such high air pressures as the ones required in this study, very specific materials, sizes, capacities and tools are required. Purchasing materials can be both time consuming and arduous. Often different components need to be ordered or manufactured in different sizes and materials from different parts of the world and experimented with before reaching any working assembly. All of this highly delays the fabrication time, even more so when mistakes are made. We add to this pictorial, as a supplementary file, a list of materials and manufacturers that designers can refer to when initiating a soft robotic project.

Designing a garment for such an expansive movement-based activity such as dancing often means making a compromise between seamless wearability and effective actuation. Particularly when considering the limited status quo of silent or lightweight air sources research, designers must often self fabricate their own creative solutions using cutting edge technology [8,22,71].

Reflections on the Design Process

Throughout our design process, a number of design choices were made comparing different materials, shapes, sizes and their predicted outcomes. Many of these were done based on the first author's experimentations or previous literature, while others were born from our own somaesthetics experience of the design iterations. While our final wearable already presented us with interesting and promising results when sharing it with other participants, we are aware that there are limitations to auto-biographical design approaches. Indeed our design might have favored the first author's personal take on dance by focusing for example on a specific part of the body such as the legs. Many different design alternatives could also be implemented to bring forth further insights as well as complement the participants' overall experience. Nevertheless, our results show how our wearable acted as a choreographer when it prompted the dancers with haptic cues sent to them at specific timings on a specific part of their body which led them to make precise movement choices while dancing. This interplay between the dancers and the wearable is why we borrow the metaphor of the choreographer to describe our wearable. While the design of soft robotics and its application to movement-related practices are still at its debut, our specific design, as hinted by our participants, provoked a range of rich and deep somatic reflections on how these technologies can be integrated to guide and inspire people's embodied practices, just like a choreographer might do.

CONCLUSION

This pictorial describes our auto-biographical somaesthetic design of a soft robot for lower limb movement guidance that aims at providing a wearable choreographer to dancers. We first present an account of our process. We then describe an experiment where we share our final design with four dancers. The results of the experiment illustrate how the wearable constrains and inspires the dancers and how it was perceived as a choreographer acting on their body. Finally, we discuss our process and our results in light of the promising and challenging design space that soft robotics open when applying such technology to dance and embodied creative practices.

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