



Spire to Wear

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Mentor Statement. This project was developed as part of an interdisciplinary Wearable Product Design course that I taught, and this student team had an exemplary design process, building upon a previous Summer Scholar research project studying the Spire Health Tag technology. The challenges brought up by COVID-19 lifestyle restrictions highlighted the importance of specificity to addressing the user needs when designing functional apparel for wearable technologies. The team designed an entire capsule collection meant to accommodate the wearability of Spire device, and this design was their pilot test ensemble that they each wore and tested during lockdown. The design went through some iterations based on weekly feedback from me and their classmates. Besides being able to work as a team while in lockdown in separate locations, this team also had to creatively solve many other problems regarding availability of materials, sewing equipment, designing for their own bodies, as well as lack of professional model and photography environment (better images will be submitted as needed). The project outcome is a fine example of addressing the wearability of a new technology by offering “a delicate admixture of futurity and familiarity” (Tomico et al., 2017, p.2).

Concept. According to the Worth Global Style Network (WGSN), by 2022, wearable technology will be embedded into our everyday lives (Harman, 2018). Several biometric technologies that have been integrated into garments are already available on the market, mostly as heart monitoring apparel, but they are relatively expensive and designed around the technology, not particularly around the user’s lifestyle (Dunne, 2010). The targeted users for this project are young adult college women who lead an active lifestyle even during COVID-19 quarantine, also known as the “Worried Well” generation: the largest consumer group, that is so worried about their health and appearance to the point that they hope to always be well (Owens & Cribb, 2017). These users demand multifunctional garments that allow hopping between online classes, lounging at lunch time, taking stylish selfies, working out in their living room, and inform them how well they performed each day (Haram, 2020). The design team tracked their own lifestyle in lockdown for one week and created a functional profile for this project. The aim was to create a look that is fashionable, visually cohesive, multifunctional, comfortable, and incorporates a wearable biometric device. Specifically, The Spire Health Tag technology was studied in detail during a Summer Scholar research project by one of the team members, and she had specific user experience with this health and fitness tracking device (Spire Health, 2018).

The Spire to Wear ensemble was created to accommodate the daily wear of the Spire Health Tag, a 2”x2” rigid black plastic box, with adhesive backing that can be attached inside close-to-skin clothing. The adhesive is however inefficient over repeated wearing sessions, it can be displaced during high impact exercise, and it can also damage the user’s undergarments by leaving behind adhesive residue. Therefore, the purpose of this project was to design an alternative Spire tag attaching system that can be integrated into an athleisure ensemble comfortable to lounge in, suitable for workout, and fashionable for daily wear.

Common challenges to integrating wearable technology into athleisure were encountered, such as accommodations for the size and location of the sensor embedded technology. The new solution consists of a detachable three-dimensional pocket tailored to the exact size of the wearable device. The Spire tag needs to be placed exactly below the waist or chest (left or right) of the body (Spire Health, 2018). Therefore, 1”wide grosgrain strips with snap attachments on each side, that we named *toggles*, were placed in these body locations inside the close-to-skin garment layers, and two slits on the back of the Spire pocket were made to allow the toggles to be threaded through the pocket. The Spire device is inserted in the pocket, and the toggle snaps attach the device inside the garment. A demo of the new system is available at <https://www.flickr.com/photos/188917055@N04/50009282546/in/shares-YnZgpQ/>

Processes and Techniques. The materials used for Spire to Wear ensemble were all knit fabrics selected to create a functional and balanced mix between soft, comfortable, tight and moisture wicking properties. The light color palette was chosen to suggest calm and comfort. The 3- piece look consists of: (a) a pair of sky blue French terry-cloth shorts with slightly longer bike-shorts attached, made of navy compression nylon/spandex fabric, (b) a sports bra made of navy nylon/spandex ribbed fabric with white fold over nylon elastic binding, and (c) a sky blue half sleeve French terry-cloth sweater with navy long sleeve nylon/spandex jersey fabric. The pocket to accommodate the Spire device was made of lightweight white microfiber polyester fabric that allows the device to capture accurate information.

The shorts have large three-dimensional pockets on the hips, with snap-closed flaps to accommodate for larger objects such as a phone. It also includes one toggle with snaps inside of the waistband for Spire pocket attachment. The sports bra has a double layer construction. Its interior includes a 2” elastic band for underbust support, and two separate slots allowing insertion of removable breast pads. A toggle is attached to the inside layer of the sports bra, close to the underbust band on the left side. Lastly, the two-in-one sweater has a detachable midriff piece that allows for modification to the user's preference (Figure 1). The front attaches to the top part with white snaps, and the back is loose to provide ventilation. The sweater has versatile sleeves too: a half sleeve with a small pocket, and a compressed forearm sleeve with a small pocket and a thumbhole. All sewing used appropriate machinery for stretch fabrics, such as serging, and small fusible inserts were attached to reinforce snap placements. Pockets were applied with lock stitching and reinforced corners.



Figure 1. Sweater midriff detachment.

Design Innovation and Significance. Given some of the disadvantages of completely integrating wearable technology into garments, such as cost, limitations on launderability, fit, and fashion appeal, our multifunctional wearable solution aimed to improve on these aspects. This solution ensures a low profile, versatile and secure wearing of the Spire Health Tag, with just the low-cost addition of inside toggles to ready-to-wear athleisure fashions. This ensemble was worn and tested by the design team. The Spire device operated accurately compared to Fitbit, with slightly better results on the bra versus the shorts. Further user wear tests need to be conducted to establish garment size specification ranges determined by Spire Health Tag accuracy. This design proposal elevates the core function of clothing as protection and expressive fashion, into a beneficial and accessible tool for well-being technologies too.

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