Wo.Defy: a wearable, historical narrative told through somatic self-experience and self-reflection

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Abstract. This paper describes the exploratory design process of Wo.Defy, a bioresponsive wearable garment that integrates interaction design with feminist critique through an emphasis on intimacy, self-agency and self-reflection. Our research is based on a somaesthetics framework addressing values of self-experience, poetics, materiality, and interaction semantics. Wo.Defy critically engages concepts of cultural history and identity to develop a richer understanding of design for the self. Our research design is informed by the historical precedent of the Self-Combing Sisters, a suffragette group in early 20th century Chinese society, who challenged the traditional Chinese status quo of gender roles and social conceptions of pre-arranged marriages through their chosen dress and styling of their hair. Wo.Defy contributes to the design discourse of wearable, embodied interaction through its emphasized integration of cultural historical research into contemporary wearable design practice, braiding a feminist HCI agenda through a somaesthetics framework.

Keywords: Breath interaction, Kinetic, Embodiment, Poetic Design, Biore sponsive Wearable Technology, Self-agency, Somaesthetics, Feminist HCI, Cultural Research, Silk, Hair

1 Introduction

This paper applies cultural historical research to further enrich the design of user experience within interactive wearable technology.

Cultural history is a vital backbone of the society. It greatly influences political values that indirectly shape the behaviour, beliefs, attitudes and styles of people within it. Clothing is a cultural artifact that is highly reflective of socio-cultural values that include including self-preference and personal attitude. Clothing portrays self-identity and serves as an expressive voice within social and cultural interactions. New technological developments shape the perspectives and interactions of how people explore, experience, and interact with their external surroundings. However, amidst this focus on external cultural expression, the presence of the internal voice of the self is often

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limited or even forgotten, due to the vast attentional focus and distraction that exists in the world outside of ourselves. Our research explores how clothing can support attentional focus to our own bodystate. Functioning like a second skin on our body, our garments can bridge communication between self-agency and our surrounding environment. We have designed Wo.Defy, an interactive wearable garment to bridge the experience of the self mediated by technology and reflected within culture. We evaluate this prototype within a Research through Design methodology. Our Wo.Defy garment embeds bio-sensing technology within a cultural context to cultivate somaethetics interaction for self-awareness, self-reflection, and emotional narration.

The objective behind Wo.Defy is to develop a bioresponsive dress that incorporates a culturally enriched, interactive wearable narrative that elicits self-reflection and dialogue. Based on somaethetics practices [15], Wo.Defy 1) highlights the self-experience of the wearer, 2) formulates poetics derived from metaphors of cultural appropriation, style, history, 3) integrates materiality using silks, hair, and sensors 4) develops interaction semantics based on self-agency through incorporating breath and kinetic movement. The integration of a somaethetics framework using feminist agendas [1] within the research design facilitates self-awareness and self-reflection. Our design embodies issues that remain underrepresented within an HCI design context, and can support transformation of the self through user-experience.

2 The Self-Combing Sisters

Wo.Defy is informed by the historical precedent of the Self-Combing Sisters. Zì shū nǚ (自梳女) translates as the “Self-Combing Sisters” in Chinese [13], [16], [19]. Residing in the southern Canton Province in China from late 1800s-mid 1900s, this suffragette group challenged the traditional Chinese status quo towards females and the customs of pre-arranged and arranged marriages. Resisting domestication, many of these women held employment within silk weaving factories, which transformed them into contributors to the financial welfare of the household [19]. Through celibacy and pursuit for personal and economic independence, the Self-Combing Sisters repositioned their roles in society: women as empowered and self-sufficient figures.

These beliefs further translated into a social practice for a distinctive, self-effacing aesthetic appearance: a bounded bun or plait of a married woman, a reference to turning inward to protect the self and also a concealment of the female semblance of youth, beauty, sensuality, and seduction [16], [20]. For these women, the self-binding hair ritual inversely signified freedom from being restrained by marriage.

The design process of Wo.Defy takes as inspiration the self-responsive and critical reflection of the Self-Combing Sisters by embedding the values and daily practices through the selection of form, material, and interaction model. The cultural history articulates a foundation for the design concept and construction of the wearable dress, Wo.Defy.
3 Emphasis on Feminist Interaction

Feminism is an emerging topic within Human–Computer Interaction (HCI) and there is a growing representation of interaction design that integrates a feminist agenda. While, the Self-Combing Sisters illustrate attitudes and traits of such an agenda, their contribution to reconstructing social identity has not been explicitly acknowledged within Chinese cultural history. The 伪權主義 (女權主義) translates as the viewpoint of powerful women [11].

Wo.Defy aims to embed the attitude of 伪權主義 from the Self-Combing Sisters into the wearable design and embodied interaction with a perspective of 伪權主義. We have employed these attitudes during the design process through adopting four of the six attitudes in Bardzell’s agenda on Feminism, interaction design: Pluralism, Advocacy, Embodiment, and Self-disclosure [2].

The stance against arranged marriages by the Self-Combing Sisters transformed and created cultural models for contemporary Chinese women, presenting a greater range of self-agency and identity. The controversial actions of the Self-Combing Sisters that separated themselves from their family and community while simultaneously maintaining support for their family and community clearly illustrate attitudes and traits of feminist principles. While we can interpret their intentions as a strive for gender equality, it is more likely that their underlying intention was to maintain control of their own bodies, identities and sexual choices. Shusterman rendered a somaesthetics critique on feminine aesthetic and representation where he “encourages women to self-examine and self-maintain her somatic feelings for a better control, the familiarization of her body, and the transformation into somatic knowledge” [17].

Clothing is has an intimate relationship with the body, and wearable technology provides an optimal medium for a personal interaction and expression on the sensitive topic of feminism.

Examples of the prior work in HCI that have focused on feminist principles include Ascencao’s [1] interactive audio-visual installation, ‘Euphoric Femme’, which describes women’s sexual experiences. The design aims to improve attitudes and create a discourse that reveals the sexual subjectivity of women. Lehtinen [12] also proposes a novel approach to facilitate the qualities of feminist interaction design in HCI by analyzing the vibrator design which bridges between technology and female sexuality.

The conceptual design of Wo.Defy is an exploratory process involving socio-historical research. Our design has stemmed from a desire to include a critical reflection on the historical ambivalence that existed in both Chinese and Western cultures, particularly the historical socio-cultural stigma that denied self-agency and independence. The Self-Combing sisters gained their independence by working in silkfactories. By revealing the narratives of the Self-Combing Sisters [13], [16], [20] we provide a design context that includes the craftwork of silk weaving as embodied in their socio-historical agenda. Through investigating and evaluating historical precedents of identity construction, Wo.Defy highlights the use of critical reflection as catalysts for self-change and agency.
4 Designing for Somaesthetics Experience

Somaesthetics originally proposed by Richard Shusterman is an emerging philosophical discipline, which considers the role of body experience (or soma) in aesthetic appreciation [17]. Shusterman considers somaesthetics within three categories; analytic somaesthetics, pragmatic somaesthetics, and practical somaesthetics. Analytic somaesthetics consists of descriptive studies in our bodily perceptions and somatic practices and their usages in cognitive, social, and cultural aspects. Pragmatic somaesthetics, on the other hand, involves a normative inquiry into specific disciplines to improve our bodily experience and encourage the comparative critique. Practical somaesthetics focuses on concrete bodily practices by aiming at somatic self-improvement.

The autobiography and the Self-Combing Sisters demonstrate a practical somaesthetics of self-reflection and self-regulation in relation to the society. Shusterman argues for the value of employing somaesthetics in design work for body consciousness, which establishes a critical perspective on the social and cultural influences around us [18]. Paying attention to our physiological state can transform knowledge by enhancing self-efficacy and ameliorate our aesthetic experience, and agency. Self-awareness, self-reflection, and self-flourishing lead to a higher-level of performance [14], [18]. Wo.Defy incorporates techniques of self-awareness of body's state through directing attention to the wearer’s breath.

HCI can contribute to self-advocacy through the integration of design principles that support experiential self-evidence. Body-based somatic practices can contribute to new insights within user experience design within human-computer interaction [14]. Based on these examples, Wo.Defy has followed a somaesthetics design process to support design choices.

5 Application of a Framework of Somaesthetics Practice

Self-reflection is a self-initiated process that requires a direction of attention towards one’s experience of self. Our sense of self can be considered a set of blueprints that influence our perspective, and attitude for our own behaviour, decisions and interactions towards our surrounding [9]. An ability to accurately attend to and reflect upon the various aspects of one’s emotional and physical well-being is crucial for a higher developing cognitive ability [8].

Bio-medical studies show that a shift of attention between external and internal happenings can be supported by ‘distraction’, which diminishes external stimuli for the emphasis on internal information. Thus, self-awareness induces a focus on the self’s psychological emotions and physiological reactions [4]. Wo.Defy fosters an interactive experience that focuses the wearer through the direction of attention using breath. Supporting a somaesthetics framework through the conceptual development of the bioresponsive dress Wo.Defy [15].

Kallio introduces the idea of somaesthetics in Human-Computer Interaction (HCI) domain [10], proposing a novel approach of aesthetics in user interface design. Som-
aesthetics can support design connoisseurship within current designs of embodiment within the field of HCI through tactile interaction [14]. We present the design process of Wo.Defy in the following sections. This paper adopts four design strategies of Somaesthetic design through the lens of a feminist interaction agenda within HCI [2]. The Somaesthetics framework describes 1) the poetics of sensory interaction, 2) the design materiality through cultural reflection, 3) the semantics of interaction, and 4) experience of embodiment.

6 Wo.Defy: Defying Expectation

Fig. 1. Wo.Defy 2013

Wo.Defy is a bioresponsive wearable dress that explores the somaesthetics of biological interaction with a feminist viewpoint. Wo.Defy focuses on internal as physiological and emotional data through intimate, sense-based experience with the reactive garment. The designers have adopted their own cultural heritage throughout the design process of Wo.Defy. Historical research of Self-Combing Sisters were used as inspiration to select material, form, color, textures, and symbols for the wearable design. The integration of cultural associations drawn from the Self-Combing Sisters constitute four focal points in the design of Wo.Defy: 1) Poetics in design and interaction 2) Materiality of self and cultural history 3) the Semantics of Expression, and 4) the Experience of the self.

7 Poetics in Design and Interaction

Wo.Defy borrows from the culturally rich background of the Self-Combing Sisters. Wo.Defy collects physiological data to both reveal and conceal body state. Inspired by the practice of Noh Theatre, Wo.Defy reveals wearer’s the internal emotions through their inner body rhythm, which is expressed through the act of breathing [6]. A custom breath band made of a piezo force sensor and a soft circuit wraps around
the wearer’s mid-chest collecting the amplitude of each breath. The model of noticing a shift between behavioural breathing and emotional breathing illustrates a shift in body state [3], [7]. Wo.Defy supports a design concept of self-disclosure and embodiment [2].

Fig. 2. The Neckline and the Broaden Shoulders

Wo.Defy incorporates elements of gender blurring which is reinforced by the widened shoulder pad of the traditional qipào (旗袍) and a symbolic reference to the male’s broader shoulders and a higher ranking in the family hierarchical structure. This is also supported through the inverted neckline of the traditional qipào dress. A left overlapping neckline resembles an identity reserved for the male as the Chinese heritage holds a structure of male being on the left and woman being on the right. Wo.Defy mixes these cultural designs to mirror the counter position in social and family structure of the Self-Combing Sisters for their economic and financial contribution [2].

The white colour of Wo.Defy resembles two contrasting meanings from two different cultures. In the Chinese culture, white is seen as a mournful colour that signifies the ending of a life in funerals; on the other hand, white suggests purity in the Western culture and is often used in wedding for a symbolism of a bright, new chapter in life. Wo.Defy exercises pluralism [2] by disturbing the regulation of the Chinese culture. The designers replaced the lucky red and gold colour palette with an unlucky white colour into the traditional wedding qipào dress as a commentary to the burial of beauty and sexual relationship of the Self-Combing Sister.
8 Materiality of Self and Cultural History (Form and Material)

Materials are selected based on their literacy, agency and sensitivity to the cultural background, body, and mind. The Self-Combing Sisters were favoured in the silk factory during the industrial revolution due to their freeing from domestic obligations. These women have contributed to a significant economic growth in the Southern Canton province of China around the late 1800s [19].

Various forms of raw silk are hand sewn for the construction of Wo.Defy to symbolize versatility of the Self-Combing Sisters, demonstrate craftsmanship in silk weaving art, and honour their constructive contribution to their community. The foundation of the wearable is made of dupioni silk fabric where hundreds of silk chiffon flowers lay organically from the trunk spreading towards the feet of the dress. Extending from the left neckline to the waistline of Wo.Defy is a small black strand of human hair interwoven into a long braid of white silk fibers. The progressive transition from the black human hair to the white raw silk fiber visualizes a process of concealing beauty and resisting sexual relationship for a self-disclosure on celibacy and self-sufficiency.

Human hair acts as an analogy and structure for the conceptual development of Wo.Defy since hair narrates one’s life story through literally documenting the health and vitality of the body. The incorporation of black hair with white silk parallels life to death cycle, conceal revealing self-state, and resisting external influences for self-choice to establish pluralism [2].
9 Interaction Semantics

The Lilypad Arduino board on the left chest collects the hidden breathing pattern of the wearer. The expansion and contraction of each breath is translated as a pulsating light pattern on Wo.Defy. The light-emitting diodes illuminate as the chest expands to compress against the force sensor and dim as the chest contracts to loosen the tension towards the force sensor.

Fig 5. (Left) The breath chest band containing the squared FSR sensor transmits pressure data to the Lilypad Arduino microcontroller. (Right) The LEDs illuminate based on the values sent from the Lilypad Arduino microcontroller board.

The Arduino Uno microcontroller board on the back captures the slightest movement of the wearer with a Lilypad tri-axis accelerometer located on the vertebrae. When the wearer generates any motion, the servo motors pull a bunch of translucent threads which connect to a bed of silk chiffon flower throughout the dress. The contracting and dilating silk chiffon flowers caused by the kinetic input draws metaphor to the contraction of pubococcygeus muscles. This reference to the female body advocates personal choice.

Fig. 6. The shoulder shells houses the 2 servomotors that pull on the organza flowers.
The synchronous expression and artistic mimicry of the physiological information considers the bioresponsive dress as a ‘sister’ who fosters an opportunity for self-disclosure. The acts of illuminating/opening and dimming/concealing of visual expressions on Wo.Defy enact as self-control and self-agency through self-experience. Anthropomorphic expressions are reflected in the lights that illuminate and flowers that contract and expand on the surface of Wo.Defy.

10 Experience of Embodiment for the Self

Wo.Defy invigorates the autobiography of the Self-Combing Sisters dated over two hundred years ago. The bioresponsive dress reveals physiological and emotional information of the wearer through sensors, microcontrollers and actuators. The sensual expressions on the intimate wearable dress crafts a poetic platform for an experience of history, sensuality, vulnerability, self-choice, and complication.

We gathered data on participants’ feedback of Wo.Defy. Through a series of unstructured interview questionnaires, participants of six exhibition showcases provided feedback regarding to Wo.Defy’s tendency to shift attention and provoke self-
awareness toward the body. Female participants have shown more interests and have expressed a connection with the feminine theme of Wo.Defy. Participants have observed, provided feedback, and reflected upon the need to pay attention to their own body state through technology. “I was attracted by the beauty of the dress at first, but I was able to understand the dress a lot more and discover the hidden meaning behind it as I spend more time looking and reading about it.”

Few participants were fascinated by the culturally rich implications throughout the design of Wo.Defy. “It feels like an experience of the history of the Self-Combing their personal information. “What if I want to keep my privacy?” or “What if I don’t want to show my breath data and reveal my emotion?”. The designers consider these questions as Wo.Defy’s initial success in provoking questions in the wearer for self-reflection upon their body’s state and self-choice.

Our initial findings collected from two conferences and four exhibitions have indicated a potential for designing for self-observation. Through the use of body-based sensors, wearable technology can support ameliorative design. Wo.Defy’s design process and interaction is inspired by the Self-Combing Sisters and integrates interaction that invites self-awareness, self-reflection, and self-agency. We are designing further studies to investigate the potential in provoking self-reflection through shifting the wearer’s attention toward their body.

11 Conclusion

Wo.Defy frames its design process within a somaesthetics framework through four design values of 1) Experience, 2) Poetics of Interaction, 3) Materiality, 4) Semantics of experience-design. By revealing internal bodily information against external environments in forms of physiological and emotional data through the reactive garment, Wo.Defy was informed by the narrative of the Self-Combing Sisters design of their own lives. We raise critical questions around design for self-awareness and self-reflection.

Wo.Defy has explored a feminist agenda within a somaesthetics interaction design process including concepts of Pluralism, Advocacy, Self-disclosure and Embodiment [2]. Wo.Defy utilized the practice of pluralism by incorporating material signifiers that reference Chinese cultural practices; Wo.Defy is constructed with black hair and white silk, referencing the life to death cycle within Chinese culture. Self-disclosure is designed through the visibility of the wearer’s states incorporated through the breath sensor, accelerometer and the kinetic response of the floret designs to the bio-data. This references the Self-Combing Sisters stance toward their own agency of their bodily and economic choices. The design of Wo.Defy embodies these historical concepts through its material design process.

12 Discussion and Future Work

Wo.Defy has combined a framework of somaesthetics practices with a feminist agenda to advocate for design practices that support self-awareness, -reflection, and -
disclosure that can ameliorate user experience. Our initial qualitative data gathered from participants at 6 exhibitions has indicated that a cultural historical narrative can create a context for shaping user awareness of their own state. Participants used a talk aloud process that reflected upon both self-revealing and self-concealing expressions through a bioresponsive technology based on breath. Our initial findings benefit the designers to further the research on crafting an embodied instrument for reflection towards developing our attentional skills. As highlighted by Shusterman [17], the application of somaesthetics to designing technology that supports attention to one’s own state can lead to knowledge for an increase in everyday emotional and physical well-being. In our next stage of research we will iterate the prototype and develop an evaluation strategy to assess breath input as a mechanism to address self-observation. This is an application of practical somaesthetics strategies in user experience. Wo.Defy contributes to the design discourse of wearable and embodied interaction through its integration of cultural historical research as a context for contemporary wearable design practice, braiding a feminist HCI agenda through a somaesthetics framework.

References