Designing Technologies for Intimate Care in Women

by

Teresa Almeida

A thesis submitted in partial fulfilment of the
degree of Doctor of Philosophy
in Computing Science

School of Computing Science
Newcastle University
May 2017

Abstract

Designing for intimate care remains an underexplored area of Human-Computer Interaction (HCI): while technologies for health and wellbeing might be plentiful, technologies for intimate care are limited. Intimate care is associated with personal hygiene, bodily functions and bodily products, and is a lifetime practice that requires well-defined interventions – by the self, or supported by others. With a move to experience, HCI has explored and responded to some of the concepts of intimate care in recent research, by addressing taboo and life disruptions. However, a wider understanding and conceptualization of intimate care work is missing from the broader HCI discourse on health and wellbeing, as well as a distinct framework for negotiating the design of technologies of intimate care. Addressing this space is noteworthy, within a field that designs technologies to support, enhance, and improve human life (Kannabiran et al. 2011). It is possible that this is related to uncertainty regarding the challenges that technology might bring to intimate interactions, particularly the challenges faced in practices that encompass bodywork and proximity to hidden parts of the body, and the impact of troublesome topics upon wellbeing education.

The aim of this research is to enquire into the integration of digital technologies and intimate care towards the development of technologies for engagement with intimate care practices in women. I seek to investigate a methodological approach with a focus on the woman to understand the challenges of designing for and with intimate care; explore the qualities of such woman-centered approach in practice. In this thesis I present three case studies that incorporate empirical methods and new designs that I developed throughout this programme of research. These include 1) ethnographic observations of women's health physiotherapy within a clinic to understand the components of intimate care within a professional setting; 2) a design toolkit that explores e-textiles for teaching female pelvic fitness, delivered through a series of workshops in which discussions that blended humour and laughter made it entertaining and less embarrassing to ask questions and to express curiosity about intimate bodies; 3) Labella, a probe/intimate wearable for self-learning about hidden parts of the female body and a technology which encompasses embodied interaction, that aims to contribute to breaking down the taboo of looking at oneself to help reduce the barrier of self-care. Furthermore, Labella aims to support knowledge of the other, while exploring perceptions of esteem and reliance towards practices of care within the body. These three case studies begin to explore and offer insights on how designing for intimate care is entwined in woman-centered approaches to design.

This thesis contributes to interaction design research and outlines a framework for designing technologies for and with intimate care in women. The research highlights how intimate care pervades personal and professional settings, and its significance throughout the lifecourse.

Specifically, I contribute to an underexplored area of HCI, women's health (outside maternal health) by focusing on a woman-centered methodological approach. In doing this, I explore this approach in practice through challenging existing practices of care within women's health and by offering novel design concepts and devices, in which I explore humour in design as a method to support learning of sensitive topics and as a tool to diminish the taboo nature of the interactions. Lastly, I propose woman-centered design as a novel form of inquiry in design practice research.

Contents

Appendix Chapter 7

Labella: Selection of photos and illustrations

Labella: Conferences (photos of installation/display)

Sample Thematic Analysis: Mapping (women only study & study with couples)

Interview schedule

Sample of information sheet and consent form

List of Figures

Publications & Awards

Teresa Almeida, Rob Comber, Gavin Wood, Dean Saraf, and Madeline Balaam. 2016. On Looking at the Vagina through Labella. *In Proceedings of the* ACM SIGCHI Conference on Human Factors in Computing Systems *(CHI '16)*, 1810–1821. ***Best Paper Award*** *(top 1% submissions).*

Teresa Almeida, Rob Comber, and Madeline Balaam. 2016. HCI and Intimate Care as an Agenda for Change in Women's Health. *In Proceedings of the* ACM SIGCHI Conference on Human Factors in Computing Systems *(CHI '16)*, 2599–2611. ***Honorable Mention Award*** *(top 5% submissions)*.

Teresa Almeida, Gavin Wood, Rob Comber, and Madeline Balaam. 2016. Interactivity: Looking at the Vagina through Labella. *In Extended Abstracts Proceedings of the* ACM SIGCHI Conference on Human Factors in Computing Systems *(CHI EA '16)*, 3635-3638.

Teresa Almeida. 2015. Designing Intimate Wearables to Promote Preventative Health Care Practices. *In Adjunct Proceedings* of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and ACM International Symposium on Wearable Computers *(UbiComp/ISWC'15)*, 659-662.

Teresa Almeida, Gavin Wood, Dean Saraf, and Madeline Balaam. 2015. Labella. *In Proceedings of the* 2015 British HCI Conference *(British HCI '15)*, 310–311.

Teresa Almeida, Gabriella Arrigoni. 2014. Subjective Epistemologies: Inconsistent Artefacts in the Redesign of Medical Devices. *In Proceedings of the* Digital Research in the Humanities and Arts Conference *(DRHA2014)*, 159-164.

Gabriella Arrigoni, Tom Schofield, David Chatting, **Teresa Almeida**, Annika Haas, Benjamin Freeth, and Diego Trujillo-Pisanty. 2014. Betagrams: Maker Culture and the Aesthetics of Prototyping. I*n Proceedings of* All Makers Now? Falmouth University, UK.

Teresa Almeida, Rob Comber, Patrick Olivier, and Madeline Balaam. 2014. Intimate Care : Exploring eTextiles for Teaching Female Pelvic Fitness. *In Proceedings of the* 2014 companion publication on Designing Interactive Systems (*DIS Companion '14)*, 5–8.

Other Awards

O2 NextGen Digital Challenge Awards 2016, UK. Labella. ***Nominated.***

Student Design Competition, 6th Augmented Human International Conference 2015, Singapore. Labella. ***2nd Place Jury's Award.***

Chapter 1. Introduction

1.1 Why Women's Health?

Designing for women's health remains an underexplored area of HCI, particularly outside informational systems for maternal health. Key issues affecting women's health, which by definition can be broadly defined as health issues and problems which either only affect, or are more prevalent or severe among women, include access, quality of care available, as well as the positioning of women and their bodies within society (Tinker et al. 2000). Moreover, while HCI has long studied and developed technologies for health and wellbeing (Meyer, Lee, Siek, et al. 2012), there is a lack of research exploring how digital interactions might support health and wellbeing in relation to intimate parts of the self, that is, for *intimate care*. Intimate care has been defined as work entailed in caring for intimate parts of the body, in relation to bodily fluids, body functions and personal hygiene (Ward & Whittick 2011). Such work has primarily been defined and undertaken where intimate care has explicit legal and ethical concerns, such as in nursery and junior schools. Yet intimate care exists beyond childhood and is part and parcel of a lifecourse. For example, differently abled and aged bodies may reflect different stages in life, and therefore distinct caring mechanisms are applied to support flux and changes to the body.

Intimate care, due to its specificities - associated with personal hygiene, bodily functions and bodily products – is a lifetime practice that requires well-defined interventions – by the self, or supported by others. In spite of this, intimate care is often considered taboo. As a practice, it is often ignored, and discussion of it is deliberately repressed due to the nature of its bodywork and proximity to hidden parts of the body. In this thesis, I show how lack of body knowledge bounded to taboo come together to create conditions which lead to a diminished health experience. I am particularly concerned with the quality of women's health care and the potential for HCI to positively improve the options and experiences available to women within this context.

There is an evident lack of innovation in, and exploration of, the design space of intimate care within the field. With a move to experience, HCI has explored and responded to some of the concepts of intimate care in recent work. For example, taboo experienced around life disruptions, such as intimate partner violence, homelessness, and death (Clarke et al. 2013, Dantec & Edwards 2008, Massimi et al. 2012, Massimi et al. 2011), and a cultural taboo, that of menstruation, has been evaluated as design material in (Bardzell et al. 2015). The latter

already highlights the complexity of cultural and social norms in relation to issues of the intimate body and the stigma that affects the technologies designed for it. Yet, a wider understanding and conceptualization of intimate care work is missing from the broader HCI discourse on health and wellbeing, as well as a distinct framework for negotiating the design of technologies for intimate care. In this thesis, I present my approach to designing in this context, and investigate the practices and processes associated with the domain of women's health, in particular regarding intimate body literacy and associated care. In so doing, I show how intimate care is a prevalent feature of women's health. I extend feminist HCI (S. Bardzell & Bardzell 2011) by conceptualising women's health for the HCI community, and address the challenges and opportunities associated with working and designing for this space.

1.2 Motivation

The research presented in this thesis explores the role of digital technology in promoting health and wellbeing in relation to practices of care within the body. As mentioned, women's health has seen limited intervention and research in HCI, e.g. urinary incontinence in women: a bodily matter that involves prevention, management, and diagnosis. Whereas diagnosis is primarily confined to the medical institution, and preventative care practices entail appropriate understanding and knowledge of bodily functions and anatomy, advancements in technology promise to transform the way we enact self-care and, furthermore, care of others.

As I will describe in Chapter 5, life events, such as childbirth or ageing, are often accepted as the main causes for the body disruption of urinary incontinence in women (Peake & Manderson 2008, Hale et al. 2009). However, as the ongoing health issue that it is, continence care is seemingly misunderstood, if not absent, from conversations but also from the school curriculum or any other informed discussions outside a consultation room.

Personal anecdote

To gain insights on the topic, and at the very beginning of this course of research (early 2013), I conducted a pilot study with a small group of fellow researchers at the workplace. This study aimed to explore possibilities for digital interactions to contribute to and stimulate preventive action in relation to incontinence. In wanting to gain an understanding on how much this area of research in HCI is under-represented and explored, and the reasoning

behind why that might be so, plus to probe such an approach in its potential significance and impact to women's health, we talked about women's pelvic floor muscles[1].

The study focus was on preventative care and action, i.e. pelvic floor muscle exercise and training (the goal of pelvic floor muscle exercises is to strengthen and gain control over the pelvic muscles). Conversations evolved around education on the body and designing technologies that could promote practice routines and encourage motivation, eventually the need to innovate in methods for engagement and to design in ways that destigmatize and demystify through situated knowledge. Despite the fact that there is a wide range of body-aware, self-tracking apps, such as (FitBit, Jawbone), there are body parts that, acknowledged the concern and the growing interest on designing for the promotion of a fitness regime within HCI, are either missing from the discussion or are only partially addressed. Recent examples of on-body, smart wearables are kGoal (Minna 2014) and Elvie (Chiaro 2015), designed to track PFM strength in women. However, as I will argue in this thesis, they do not reflect an inevitable, inclusive knowledge of the body, as underlined by the pilot study.

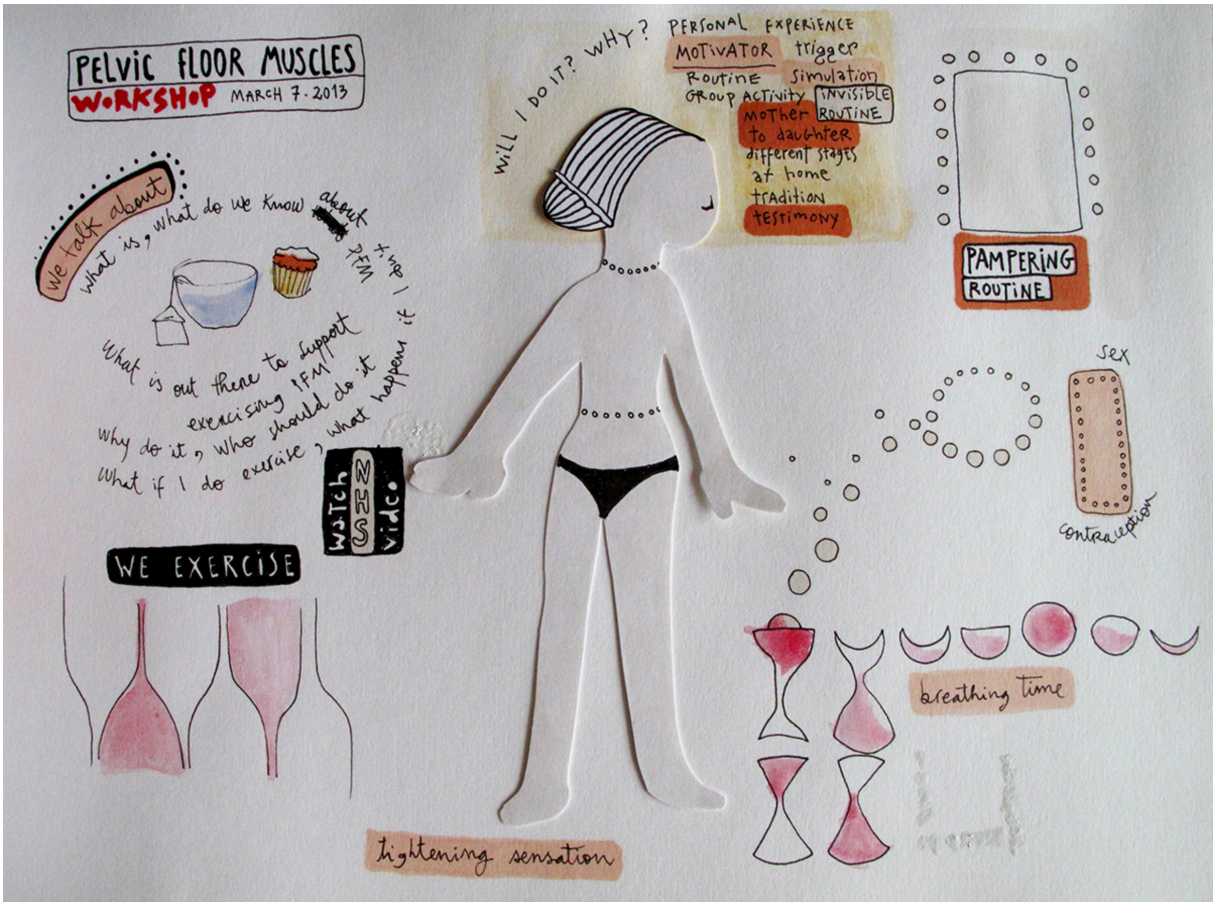


Figure 1: Graphic report, Pelvic Floor Muscles: a pilot study workshop (2013)

[1] The pelvic floor muscles (PFM) are the only muscle group in the body capable of giving structural support to the pelvic organs. A dysfunction can occur at anytime, either at an early age, after childbirth, or menopause, affecting sexual health or e.g. result in incontinence (i.e. the involuntary leakage of urine).

1.3 Research Aims and Questions

The research is therefore motivated by the following two aims:

• To generate and build on methodological approaches within HCI that focus on health and wellbeing, particularly in designing technologies for intimate care in women's health.

• To shape an agenda for intimate care in women's health within HCI by advancing a woman-centered approach and design practice.

In meeting these aims, I started by asking the following questions:

• *How is women's health understood in HCI and what impact does that have in the design of technology and interventions?*

• *What approaches can be used to support women's health within HCI and inform the design of caring technologies for women?*

• *What are the challenges and opportunities of designing for women's health and how can these technologies enable care of the self and the other?*

1.4 Thesis Structure

In Chapter 2, I give an overview of current literature on designing for women's health and intimate care practices within and around concepts of the body. This is followed by Chapter 3, in which I give an account of critical-humanist approaches to designing technologies for women with an emphasis on body politics and social justice: a woman-centered approach. In Chapter 4, I describe the procedure and methods undertaken to create novel designs, deploy and evaluate the woman-centered approach as introduced in the previous chapter. In Chapter 5, I describe a participant observation study that took place between February 2014 and September 2014. This comprehended being an observer within the practice of Women's Health Physiotherapy, at the Royal Victoria Infirmary (RVI) part of the local research hospital in Newcastle upon Tyne, UK. In Chapter 6, I describe the design and development of a toolkit, which was deployed in a series of workshops with communities of women. In Chapter 7, I introduce the design work and deployment of Labella, a system for body awareness in

women. In Chapter 8, I offer a discussion on designing for women through the lens of woman-centered design, its challenges and opportunities.

Chapter 2: Intimate Care in Women's Health presents a contextual review of the literature focused on issues such as health and wellbeing, body-worn technologies, and technologies for self-learning. The review will draw on a multitude of disciplines e.g. sociology, feminist theory, philosophy, to outline what I mean by 'intimate care', and HCI and interaction design to review the context of, and the different approaches in, developing of my case studies. This chapter also identifies gaps in the literature and approaches to existing technology design that this research endeavours to address, while positioning and grounding this work within current HCI research.

In *Chapter 3: A Woman-Centered Approach,* I discuss the development of the methodology and describe the interdisciplinary and critical approaches to designing for women-centered experiences. Drawing from humanistic HCI and feminisms, I critically reflect on how design and gendered artefacts that account for women's subjective lived bodies can promote positive experiences in health and care. I propose a woman-centered methodological approach to designing technologies, one that explores the potential of novel and creative ways for technology to improve women's experiences in health transactions, choices, and rights, and support an agenda for HCI and intimate care as agents of change.

In *Chapter 4: Woman-Centered Approach in Practice*, I position a woman's health approach within the scope of empathic inquiry and methods, and one that takes bodily integrity and women's rights into perspective. I will outline the practical application of methods through the case studies involving participants in design workshops (small groups), individual participants, and pairs. Furthermore, I highlight how such approaches supported my own research and design exemplars discussed in the following chapters 5, 6 and 7.

In *Chapter 5: Intimate Care Work in Women*, I describe notions of urinary incontinence in women as an example to how a disruption to the biography of the body evokes the need for intimate care. I introduce the observational study that I undertook within a clinic (RVI) and a women's health physiotherapy context, to understand the components of intimate care within a professional setting, and describe the findings and results from this eight months long placement. The chapter outlines this empirical fieldwork and acknowledges current practices and tools in use, to further inquire the practical challenges of attending to the body within the public health care system. In doing so, it contributes insights on conceptual and

methodological approaches to designing for intimate bodily knowledge and prospective change in women's experiences of care, which I will continue to explore in Chapters 6 and 7.

In *Chapter 6: An eTextiles Toolkit*, I discuss a design toolkit for exploring women's pelvic fitness and consolidate the design requirements for exploring body literacy and intimate care in HCI. In this stage of the research, I created a toolkit that integrates e-textiles as the core material to be used within a series of workshops to teach and learn about intimate parts of the self and to support body literacy, specifically to explore body organs that are intimate, but also problematized by touch and visibility (Almeida et al. 2014). The wearable e-textile toolkit enabled conversations around intimate care and afforded participants the ability to shape the educational content to their own bodies. The results of this work revealed that qualities of body knowledge can be affected by topics of taboo, misinformation, and lack of self-awareness. In light of this, I will argue that we must recognize a lack of literacy that might hinder wearable digital products from being useful, by identifying a gap between these items and practical or anatomical knowledge of the intimate part of a woman's body. The evidence that a wearable interface supports situated learning about the intimate body, and the ways in which taboo interactions were negotiated with humour prompted me to conceptualize and develop Labella, which I discuss in Chapter 7.

In *Chapter 7: Labella*, I discuss Labella, an augmented system that supports intimate bodily knowledge and pelvic fitness in women. In developing Labella I drew from the outcomes of previous research as described in Chapter 6. This study aimed to evaluate this system as supportive of learning through playful interaction, and humour in design as a tool to promote access to learning.

Within the scope of Labella I use the word vagina "as a stand-in for women's genitalia more generally" (Frischherz 2015), employing "common-sense" knowledge of bodily parts to engage women in understandings of their own intimate anatomy[2]. Deploying Labella included first, a study with women only, and second, a study that involved couples (intimate partners). I describe both studies and highlight the opportunities for technology design and embodied interactions to enable and support body literacy by potentially enhancing self-knowledge, but also in providing for knowledge of other.

[2] As I will mention in Chapter 7, the naming of vagina and not vulva in (Ensler 2001) has been highlighted by feminist authors as inaccurate and unwanted (Labuski 2013).

Chapter 8: Woman-Centered Design, will offer reflections on the approaches that have been adopted and issues that have arisen from the research outcomes. I discuss how understandings of women's health in HCI have, so far, shaped current approaches and contributed to the absence of critical discussion within the field. I highlight the advantages of doing woman-centered design by reflecting on design directions and methods that, as advanced by this thesis, are well positioned to inform the design of caring technologies for women. The approaches taken were varied in ways of participant engagement, material outcomes in design, and resources. I discuss how such approaches have contributed to the experiences of designing for women as introduced in this thesis, and highlight humour as a creative strategy to advance body politics and as a critical tool that helps to ignite conversations on taboo, such as that of women's intimate bodies and health.

1.5 Contributions

The thesis contributes to an underexplored area of HCI, women's health (outside maternal health) by focusing on a woman-centered methodological approach, through exploring woman-centered approach in practice, and by proposing woman-centered design as a novel form of inquiry in design practice research. It uses the lens of humanistic HCI to challenge existing practices of care within women's health and to offer novel design concepts and devices.

The thesis pays particular attention to intimate care in women's health and advances an agenda for change within HCI as a field that can transform women's care practices and experiences. It contributes to interdisciplinary approaches that combine theoretical, qualitative, and research through design methods to deliver toolkits and prototypes that expand current approaches to designing interactions and the body; contributes insights on the role of humour in designing for taboo and provides design exemplars showing the application of digital to taboo body spaces.

Chapter 2. Intimate Care in Women's Health

2.1 Introduction

In this Chapter I discuss literature on women's health and designing for intimate care within HCI. I focus in particular on technologies that are designed to support a woman's reproductive and sexual anatomy, functions, and management. To begin, I review current approaches to designing for the health of women in HCI, in essence dealing primarily with topics of maternal health care and (self-) tracking devices (Enquist & Tollmar 2008, Peyton et al. 2014, Kumar & Anderson 2015). This body of work mostly delivers quantified and digitized data, which, as much as it is useful, it is withdrawn from the complexity of the subjective experiences of being 'woman' (Lupton 2014a). Following this, I attempt to conceptualize intimate care by drawing from a multitude of disciplines that speak about and to the female body, including feminist theory, philosophy, and sociology (Grosz 1994, Shildrick 1997, Atkinson 2011). I follow up by exploring how HCI can benefit and be beneficial to this underexplored area of research and intervention and discuss a technology currently in use for the intimate care of women: the speculum (Sandelowski 2000, Rossmann 2008). Through this discussion, I argue that HCI is well positioned to explore possibilities for women friendly designs of technological devices that nonetheless consider the qualities of intimate care that I put forward within this review: knowledge, esteem, and reliance – of the self and others. I go on to discuss embodiment within technology and explore how current practices in HCI embrace varied perspectives on the body and consider the crossover between self-tracking, engaging in learning, or playfulness to deliver experiences in support of health, that enable the construction of knowledge, or simply support managing of bodily awkwardness. In doing this, I borrow from literature on humour as a positive approach to communicate sensitive topics (Johnson 1990), as a resourceful tool in professional intimacy between patients and clinicians (Scholl 2007), or beneficial to manage embarrassment (Meerabeau 1999), and explore the feasibility of applying it within topics of women's intimate care that involve body literacy. I conclude with a summary of the potential for technologies designed for enablement (Dombrowski et al. 2016), specifically for knowledge, to create opportunities for change, and consequently have a real impact on women's health.

2.2 Women's Health and HCI

"Being a man or a woman has a significant impact on health, as a result of both biological and gender-related differences" (WHO 2016b). The health of women and girls tends to be defined as health issues and problems if they only affect women and girls, or if these issues/problems are more prevalent or severe among them. Under this definition women's health will include issues such as menstruation and menopause, through to cervical cancer, sexually transmitted diseases, and pregnancy (Bustreo 2015). Women's health directly impacts upon maternal mortality, cervical and breast cancer mortalities, unwanted pregnancies through to sexual violence and female genital mutilation (Tinker et al. 2000).

Delivering good quality healthcare to women is rife with problems. Body disruptions, control, and flux are topics explored within gender studies, feminist theory and philosophy to characterize the complexity of women's bodies (Shildrick 1997, Lennon 2010). In exploring a design engineering perspective, Rossmann argues that the female body has historically been a subject of taboo, limiting the development of women's health in general (Rossmann 2008). Further, as acknowledged by Kannabiran et al. in (Kannabiran et al. 2011), works such as (Rossmann 2008) illustrate the implication of designing technologies for the practices of women's health in HCI. In so doing, Kannabiran et al. note that work such as this is "much needed and can have immediate and positive effects on human life" and that the impact of such work "extends beyond the individual and affects larger social concerns". This call for action prompted this research into the practices and processes associated with the domain of women's health more broadly and in HCI specifically.

My review of the existing literature within HCI (to date) shows that the vast majority of work within the context of women's health is focused on maternal care. Research in HCI range from technologies to increase empathy within partners (Kosaka et al. 2011), through to tools to support healthcare record management across pregnancy (Enquist & Tollmar 2008), and mobile tools to encourage healthy behaviours in pregnant women (Kumar & Anderson 2015, Peyton et al. 2014). In addition, there is a body of work focused on upskilling and supporting midwives and health workers in developing countries (Alam et al. 2010, Ramachandran et al. 2010, Underwood et al. 2013). A smaller volume of work has explored other elements of women's health, for example, the development of a mHealth platform to support women going through the menopause (Lee et al. 2015) and the exploration of mobile applications for reminding women to take their contraceptive pill (Stawarz et al. 2014). Other work has explored the specific needs of women with breast cancer in the development of online social support systems (Skeels et al. 2010), as well as tools for monitoring the systems of women

with breast cancer in rural settings (Haque et al. 2012). Systems for gynecologic exam training have been explored in (Moraes et al. 2006), suggesting that medical students can learn both procedure and diagnosis from interacting in a virtual environment. For the most part, these devices and technologies do not situate themselves within the 'dirty work' of women's health, but on the periphery, offering advice about how to be healthy, or how to recognise labour, as well as easing the burden of sharing health records between healthcare providers. Such an avoidance of the body in issues relating to women's health is reflective of Rossman's claim that the female body is tabooed, and this has implications in women's health and HCI which responds to and takes account of the body (Kannabiran et al. 2011). Moreover, as recently acknowledged by sociologist Deborah Lupton in (Lupton 2014a), a number of digital technologies, namely mobile applications (apps), have been made available to monitor and track the sexual and reproductive body. An abundance of self-tracking apps may intend to persuade people to change their behaviour in the interest of health and wellbeing (Lupton 2014b), such as in observing sleep patterns or regulating exercise by collecting data and bodily functions, and providing body metrics (on e.g. heart rate, pulse, or calories burned while jogging), and apps that encourage people to self-track their sexual or reproductive practices similarly range from simply offering information or tracking, e.g. ovulation, fertility, through capturing personal health and medical data, i.e. consequently offering a quantitative understanding of one's body and functions, delivered via scientific measurement and interpretation. Sexuality and reproductive self-tracking practices, Lupton argues, while useful to keep track of ovulation and menstruation cycles and sexual activity, also risk to stereotype and "work to configure new norms of behaviour" (Lupton 2014a), and therefore are amenable to new forms of biopolitics (Foucault 1979). Not only that, such quantified and digitized data renders flat in its complexity the subjective experiences of sexual and reproductive desires. This thesis addresses the missing intricacies of such women's experiences.

Furthermore, women's health often involves intimate care work that relates to parts of the body which are considered private (e.g. genitals) or which are associated with sexuality or where the boundary of the body is penetrated (e.g. oral health). This broad definition gives rise to a number of issues, relating to how we consider 'private' parts, the sexuality of the body, its boundaries and the relationship to acceptable (and unacceptable) social behaviours (i.e. taboo). Indeed, intimate care in women's health, specifically within HCI research and design, remains a challenge. In the next section, I introduce women's health through the viewpoint of intimate care and an all-embracing construct of its qualities.

2.3 What Do You Mean, Intimate Care?

In this section, I provide background by outlining *intimate care*. I situate this care work on the body and across the lifecourse, one which comes into focus when the body's biography is disrupted, and contributes to the construction of the self through bodywork. The intimacy associated with this type of care aligns with bodily taboos and constructs of sexuality.

2.3.1 *Concepts of Intimate Care*

The Body

Historically the human body has been perceived and represented in many different ways. In the late eighteenth and early nineteenth centuries the body, its representations and routines were transformed (Gallagher & Laqueur 1987). Medical models emerged showing evidence that made sense of sexual differences between the female and male anatomy and physiology. Further on, as cultural values and constructions of the body evolve, the body becomes the ally of sexual difference (Grosz 1994) and plays a role in social, cultural, and political life. For example, the embodiment of selfhood or femaleness; the interconnectedness of self and the body; body politics. This interrelates with notions of the corporeal being as being-in-the-world (Diprose & Reynolds 2008), with perception and embodiment as constitutive elements, thereby positioning the body as a site of social production and the self. However, as argued by (Shildrick 1997), the body is a fabrication, it is "organised not according to an historically progressive discovery of the real, but as an always insecure and inconsistent artefact, which merely mimics material fixity". Marked by a deviant state, such as being ill or unhealthy, it is then characterized by a lack of bodily control, a way through which the body can reflect its biography. Nonetheless, a person's history of her own body is always involved in intimate care, whether in its most favourable or declined state.

Lifecourse

Intimate care on the body happens across the lifecourse and tools and procedures that allow for it to happen change according to developmental stage or everyday circumstances and intimate settings. For example, education for improving oral health care: teaching early oral care to children as their teeth come through involves educating and informing parents. Whereas, providing mouth care in nursing homes, where carers believe that tooth loss is a natural consequence of aging, will include providing them with adequate knowledge and supplies (Jablonski et al. 2009). Similarly, staying healthy (physically, mentally and emotionally) is a life-long effort (Meyer, Lee & Siek 2012). It is intricately embedded in daily life and daily behaviours. Our habits and behaviours at a specific stage of the human

lifecourse can either facilitate or worsen our quality of life. Hygiene, safety and healthy habits are areas in which there is often a shift in responsibility (Valois et al. 2010) as we go from infancy (where a parent is responsible) through adulthood (where the self is responsible), and then into an old age (where the self is still responsible or the responsibility needs to be shared with a carer). The implication of carework being performed within a personal sphere and private realm of personal relationships (that of a mother and a child, an adult son or daughter, and an older parent) or extended to a public realm as a consequence of requiring the assistance of a nurse or a carer helps define the taboo status of intimate care. Personal care is an integral part of any lifestyle and it is strongly associated with intimate care since it often involves attention to parts of the body that are private or involved in sexual functioning. The ability for individuals to comply with social norms around personal care is also in flux across the lifecourse, sometimes in ways that are acceptable, and sometimes in ways that invite taboo. Babies, children, adults, and older adults require different levels of assistance at different stages of their lives, or depending on their physical, sensory and/or learning impairments. Assisting a child with cleaning himself or herself following a wetting episode is an intimate care procedure and requires an adult to provide for it (Ward & Whittick 2011). But, depending upon the age of the child, such an act might draw taboo or not, depending upon societal expectations.

Disruptions to the Body

Not only does intimate care occur across the lifecourse, it also commonly comes into focus when the body's biography is disrupted. For much of the history of western philosophy, the body has been conceptualized as a possible source of disruption to be controlled (Lennon 2010). Sociological accounts of the body show us that it is seen as a cultural construction in which our dominant culture keeps reminding us to read our bodies anxiously for signs of decay and decline (Twigg 2004). All the same, as changes to the body do not occur in material isolation, they are likely to have an impact on the identity constructed around it. The body is our primary interface to the world. "The body - what we eat, how we dress, the daily rituals through which we attend to the body - is a medium of culture (Lupton 1994)". The cultural construction of the body is fashioned within and by culture; the body is a site of self-identity and is a project to be worked upon. Cosmetic surgery (Atkinson 2011) and technologies for surveillance, which can be as basic as mirrors (Twigg 2004), are techniques and tools to support control, both by manipulation and display.

Disruptions to the biography of the body can occur at any time and they are made visible in different ways. Some examples are the loss of a limb or a breast, which affect "not simply corporeal integrity, but also the sense of who we are" (Shildrick 1997). Both have a massive impact on one's self-esteem, body image, and intimate relationships (Mathias & Harcourt 2013, Schover 1991). Other disruptions and dysfunctions to the body, like infertility and menopause, raise questions about womanhood, and provoke social embarrassment (Martin 1997). Dysfunctions related to the aging body revolve around bodily difficulties such as mobility and continence, and bodily esteem may disappear at an older age (Twigg 2004). These then assimilated characteristics of the body have the power to transform intimate care, in that it might entail handling, manipulation, and touching by another. Where this can result in an intimate companion supporting or giving informal care to his or her partner, it can also result in the need for a formal, eventually paid form of carework, and support from a carer.

Bodywork

Bodywork is a term that has been used elsewhere (Twigg 2000) to describe the work that individuals undertake on their own bodies, most of the time as part of regimens of health and wellbeing. It can involve both pleasure and emotional intimacy but also areas of taboo such as sexuality or human waste. It is also associated with paid work done on the bodies of others and can include a wide range of interventions, such as beauty therapy, sex, or health care. The care of our bodies has traditionally been assigned to women (Hamington 2004, Twigg 2000) and caring has long been associated with processes engaged in by them (Thomas 1993) both in the private and public arena. "Women have long been positioned within a series of cultural oppositions in which they represent the unmarked, silenced categories of the body, emotion and nature (Lupton 1994)", in contrast with the reasoning associated with men, which asserts that men's bodies are contained and well defined whereas women's bodies are perceived as fluid and soft. These gendered identities seem to contribute to care, particularly intimate care, being performed by women.

Intimacy

A feature of the human condition, intimacy naturally overlaps with concepts such as love, self-disclosure, expression of affection, support, bonding, compatibility, identity, and sexuality (Prager 1995). Intimacy is a central aspect of being human and it is an area that offers immense possibilities for technology to enhance wellbeing in the field of interaction design (Hassenzahl et al. 2012). For example, there has been a growing interest in computer mediated intimacy as suggested in (Brewer et al. 2006), or the design of sex toys and the

relationship between intimate experience and health has been discussed in (J. Bardzell & Bardzell 2011a). Furthermore, sexual health is "the state of physical, mental and social wellbeing in relation to sexuality" (WHO), and it encompasses intimacy as a central aspect of being human.

Taboo

Certainly, recent work in HCI already explored (in terms of appropriate design methods and the development of novel digital interactions) areas of taboo that are representative of life disruptions, such as homelessness (Dantec & Edwards 2008), domestic violence and the role of technology in rebuilding lives (Clarke et al. 2013); and death; the ways in which technology interacts with the end of life (Massimi et al. 2011).

The practice of intimate care is intertwined with notions of taboo. Taboo is associated with physical, bodily and social practices that are restricted from public consumption as a result of social customs within different societies. Research and design in these areas is generally considered to be laden with emotion as well as potentially risky for the individuals involved (Lee 1993). The socially constructed nature of taboo renders what constitutes taboo different across different cultures. Both breastfeeding in a public space (Smyth 2008) and spitting in public (Chapman 1995) can each be considered taboo depending on the social cultural context. Further still, the idealization of care by societies, especially evident in the language of care - the delivery of practical or emotional support - associated with love, emotional connectedness and delicate predisposition may contribute to reduce embarrassment about the bodily, 'dirty' work of carework (Twigg 2004).

Sexuality

Part of the taboo nature of intimate care, which often involves parts of the body that are hidden or involved in sexual functioning, is undoubtedly tied to its link with sexuality. The World Health Organization defines sexuality as a central aspect of being human throughout life and which "encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. Sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs, attitudes, values, behaviours, practices, roles and relationships" (WHO). Sexuality in HCI remains a taboo topic, even though the topic of sex has seen regular contributions over the past few years, mostly around themes of online pornography, virtual worlds, performance art, and human-robot interaction, as noticed in (J. Bardzell & Bardzell 2011a). As acknowledged by Kannabiran, Bardzell & Bardzell in (Kannabiran et al. 2011),

some of the barriers that hinder research are that human sexuality is a complex phenomenon that lacks a "single universal definition", and "it is an aspect of being human that crosses various dimensions of both everyday life and academic disciplines", making it a topic difficult to work with. Sexuality needs "to come out of the margins of HCI research" and to be situated within related areas such as embodied and aesthetic interaction or feminist HCI (S. Bardzell & Bardzell 2011). By means of a comprehensive critical analysis of HCI research and sexuality, Kannabiran, Bardzell & Bardzell identify gaps in existing work and argue that since HCI is a "discipline that designs technologies to support, enhance, and improve human life", and sexuality pervades so many aspects of human life, thus the community should look into this field as worthy of study. Bardzell & Bardzell (J. Bardzell & Bardzell 2011a) is another example, where the authors explore sexuality as an aspect that "permeates our lives", as it extends to grooming and feeling good about oneself. Intimate care also pervades our lives - it is inherently part of our everyday life - and can be closely linked to sexual health and wellbeing, sexuality, and sexual technology.

Care

Care can be defined as the provision of practical or emotional support (Milligan & Wiles 2010). It manifests in activities which society recognizes as "looking after people" (Thomas 1993) such as child and family care, voluntary, social or health services. It is commonly associated with systems of social support and health care. Caregiving or caring for others usually happens within the domestic domain (caring for children, the sick, and the elderly) or the public domain, where formal organizations such as hospitals, residential and nursing homes, and unaffiliated providers such as day care centres or midwives, provide care. Features of caring for the self include socio-cultural influences of lifestyle (Dean 1989), and body knowledge, where the body's management and maintenance are all part of self caring, of promoting a healthy living, positive self-esteem and body image (Shildrick 1997). Caring is also associated with skills and practices that are gender marked, such as nurturance (Abel & Nelson 1990), and is provided mainly, but not exclusively, by women (Twigg 2000).

Understandings of (Intimate) Care

The body is a site of care (Atkinson 2011). The National Health Service (NHS) in the UK defines intimate care for children and young people as "those care tasks associated with personal hygiene, bodily functions and bodily products, which demand direct or indirect contact with or exposure of the sexual parts of the body as defined culturally by the individual (Ward & Whittick 2011)". Some examples are oral care, feeding, or toileting support.

Nevertheless, outside of an NHS perspective, intimate care continues throughout the lifecourse, and covers all areas of personal care that most adult persons learn to carry out independently as they grow and develop. There are life factors that contribute to not being able to care for oneself, such as impairment, a disability or age.
Furthermore, care work is based on a dynamics of exchange between carer and cared-for. As noted by Professor Julia Twigg (Social Policy and Sociology), whose research on embodiment and age informs this thesis, the cared-for person enters a relationship of physical and personal exposure that is unlikely to be welcome. Carers can find the need to keep bodily distance as they might feel vulnerable by the physical intimacy of care. It can affect a couple's sexual relationships as mentioned in (Roe & May 1999), and the distress provoked by bodywork can also cause a partner's discomfort. All the while, bodywork is also associated with pleasure and emotional intimacy, when creating a zone of physical enjoyment and wellbeing, for example when receiving a body massage (Twigg 2000).

2.3.2 *Technologies for Intimate Care: The Speculum*

To help make concrete the concepts discussed earlier, I use the example discussed in (Rossmann 2008): the vaginal speculum, to give evidence of the impact of a technology and the quality of an intervention in intimate care, by the self or supported by others. Moreover, as highlighted in (Kannabiran et al. 2011), works such as (Rossmann 2008) "are much needed and can have immediate and positive effects on human life" and the impact of such work "extends beyond the individual and affects larger social concerns".

The vaginal speculum (figure 2) is a medical gyneacological instrument developed during the nineteenth century, at a time when women's anatomy was "largely misunderstood (Rossmann 2008)". Being a controversial invention of a male doctor (Kapsalis 1997), it is an instrument

Figure 2: The vaginal speculum

of a “contested technology” within a somewhat contested history (Sandelowski 2000). The speculum is a medical device used to perform the pelvic exam: its “purpose is to retract the vaginal walls to allow a clinician to visually examine the cervix and obtain culture specimens for tests, such as the Pap smear (Rossmann 2008)”. It is a technology that dates back to over a hundred years ago, and in spite of advancements in technology that allow us to have a better understanding of the female body in its anatomy, physiology and morphology, it has seen little design improvements since. Whereas this is a technology that “gets its job done”, its design takes little or no account for the intimate needs, values and experiences associated with pelvic examinations or a cervical smear (pap smear test). While this is a test “which takes only minutes to perform (McKie 1996)” it is however considered to be unpleasant, embarrassing, fearful, painful, or uncomfortable by most women (Wright et al. 2005). Studies such as (Wright et al. 2005) also challenge conventional medic/nurse-patient relationships by demonstrating self-insertion as “an acceptable, innovative, simple and cost neutral change in clinical practice that increases women’s comfort and satisfaction”.

Historically, the vaginal speculum is the first in a line of “spectacular” instruments in the care of women (Sandelowski 2000), it is a technology of convenience that intersects the frontier of the body, to extend the sense of and privilege sight to the attending professional clinician in support of examination and diagnosis. This frontier, nonetheless, defines relationships of confidence with the self, the other, and the surroundings. Literature shows that women’s attitudes about such examination determine whether or not they have it, and anxiety around privacy or irritability toward doctor’s attitudes are some of the reasons offered in (Sahin et al. 2014) for circumventing it. Moreover, this is an exam in which medical practice continues to demand for visual control, in which ‘to see is to know’. Its aim being to early diagnose a potential disruption to the body and promote early treatment when necessary, ultimately resulting in better health outcomes for women. While self-insertion is discussed as having shown to ameliorate women’s comfort and satisfaction within a clinic (Wright et al. 2005), do-it-yourself (DIY) exams and diagnosis suggest to widen access to reproductive and gyneacologic care (GynePunk Lab 2012). Unlike high-technology counterpart devices, DIY instruments by GynePunk Lab include a 3D speculum, and are open source tools that anyone can have access too. I ask, however, in focusing on the crudity of the speculum and its history of materiality and sociotechnical quality, should this technology see an upgrade to its access and availability outside the clinic or should it be critically reconsidered and transformed into a thoughtful, novel, contemporary, instrumental device? Women friendly alternatives to the status quo have already been attempted with FemSpec in 2005 (see Rossmann 2008,

FemSpec's URL is no longer available), however without commercial success, or with the Delphi Screener, a device for self-screening at the clinic or at home (Delphi 2014), with current geographic limited access.

2.3.3 *Qualities of intimate care*

Friendlier devices within professional intimacy might contribute to women's health and women enacting their role as patients (Sandelowski 2000), or women to be proactive in their intimate (self) care. Still, literacy with a focus on the body is still in demand if to promote capability for health and wellbeing. Advocating *self-knowledge and knowledge of others* concerns body literacy, in its physiological, political, social, and cultural context. As mentioned previously, staying healthy is a life-long effort and routine habits, and the conscious maintenance of health and care, represent the range of activities undertaken in self-care (Dean 1989). While our bodies are built for care – daily rituals such as grooming, washing, eating (Hamington 2004), our own habits and behaviours can either facilitate or worsen our being in the world. Body knowledge is a quality of intimate care as it promotes awareness and advocates for prevention. It positively supports taking care of the self and others and can potentially contribute to safeguarding future health.

There is a wide range of technologies available that advocate self-knowledge of personal and intimate care, from good nutrition to reproductive health or pelvic floor muscle training promotion. Many of these are mobile apps available for free or at a small cost, suggesting a relatively recent proliferation of novel caring mechanisms within the public sphere. These technologies – which are wearable, portable, and mobile – can eventually be considered to promote intimate care in that they promote building capacity by engaging with and supporting healthy behaviour over time in regards to intimate care.

Once again I take the example of the vaginal speculum as a technology for intimate care, one that falls behind in what concerns embracing scientific bodily knowledge. By combining a multitude of practices to explore adequacies of bodily materials or materials that touch and intersect the body, including biomedical, design and technological, instruments as such could become or be seen as 'friendlier' objects.

Moreover, the construct of esteem and human touch are intimately related (Butts 2001). The ways bodies' touch and are touched by certain objects and the effects on the self that this has

is a quality of intimate care. Accordingly, *self-esteem and esteem for others* impacts upon the experience of intimate care.

However, the notion of esteem within intimate care is not without problems. Traditionally, most non-western societies are based on family-focused systems of caregiving (Milligan & Wiles 2010). This practice of care continues to occur, and care is defined as a private activity built around values of familial obligation. In contrast, "social democratic countries such as those in Scandinavia have a history of collective state responsibility for the long-term care of frail and vulnerable groups (Milligan & Wiles 2010)". Informal care within the family and formal care provided by a third party might exhibit different levels of esteem, which can impact on ways intimate care is performed and experienced. An example is given in (Twigg 2000), which brings attention to "the desire to put limits on the physical intimacy of the work". Not only do most carers use gloves when bathing or touching their clients, most agencies see it as a requirement in terms of health and safety. Such external barriers during acts of intimate care, while at times necessary, are indicative of associations with "negativities of the body", such as dirt or decay. It highlights bodily failures and communicates an unwillingness to touch.

By exploring the self in acceptance of the other, I reflect on the meanings of designing desired on-body or for-the-body intimate caring technologies. Such an approach necessitates taking into account the taboo and stigma associated with hidden parts of the body. However, this is not necessarily common practice within the design of medical instruments related to intimate care. Again, the evolution of the vaginal speculum is a case study in inadequate design. Whereas Rossmann (Rossmann 2008) classifies the vaginal speculum as a technology that "gets its job done", she argues that such category is not sufficient to claim it as a good design. By designing with esteem, one in which the design work accounts for the intimate needs, values and experiences associated with e.g. a vaginal examination or cervical smear, the tools and services associated with intimate care could be revolutionized to provide the desired experience, if not arguably an ameliorated one, in relation to such procedures in or out of the clinic.

Furthermore and for the most, it is not a desirable situation to rely on another, and it usually requires the negotiation of body taboos (Twigg 2000). Such is the case too, when using the vaginal speculum on a patient body. The speculum is inherently a device that intersects the frontier of the body, and e.g. discomfort is one physical and emotional state associated with

this device. Due to its material characteristics and sharpness, it doesn't conform to the body. Yet, the woman is reliant on the institution to choose medical devices that offer the best possible care and comfort. Nonetheless, institutional resistance to adopt non-standard devices, such as (FemSpec) which may benefit the woman's wellbeing as patient, withstands.

The frontier of the body is a determining quality of what constitutes intimate care. In a sense, where this frontier lies depends upon the other and one's lifecourse. Whether virtual, dermal, internal, or external to the body the frontier defines relationships of confidence with the self, the other, and the surroundings. *Self-Reliance and Reliance on Others* implies (intimate) care throughout the lifecourse. Tending to children and older people is an activity that involves levels of trust and intimacy. At times, we have all and will all have to rely on others to offer intimate care, and in the meantime we must rely on ourselves. Establishing the necessary boundaries depends on developmental stages (infancy through older years) and life trajectories (a sense of loss of bodily control can be incorporated into the history of the body and is integrated into the lifecourse). "Care is about the reproduction of both able-bodied adults and children as well those with particular dependency needs through sickness, disability or frailty (Thomas 1993)".

2.4 Embodying Technology in Care Practices

2.4.1 *Wellness Awareness Through Wearable Interfaces*

On-body and worn mobile technologies for health and wellbeing have seen an exponential growth in the last few years. An increasing number of body-worn devices for self-tracking, for example (Fitbit, Jawbone), collect data on bodily functions, such as heart rate, pulse or calories burned, and HCI research has already explored wearables toward promoting health and wellness, for example (Ananthanarayan et al. 2014, Ananthanarayan et al. 2013). At the same time, a wide diversity of 'smart' objects, such as *Elvie* (Chiaro 2015), *kGoal* (Minna 2014), and Sensoria® smart socks (Sensoria 2015), have been made commercially available. Amidst such variety of digitized body data, a great number of these devices aim to promote health and fitness with the goal of empowering self-care among experts and non-experts alike. Most relevant to the focus of this thesis are *Elvie* (Chiaro 2015) and *kGoal* (Minna 2014), which combine smartphones with smart objects to encourage and support assisted tracking in pelvic fitness. Both *kGoal* and *Elvie* (figure 3) are interactive training systems that guide, correct, and visualize pelvic exercises in real-time.

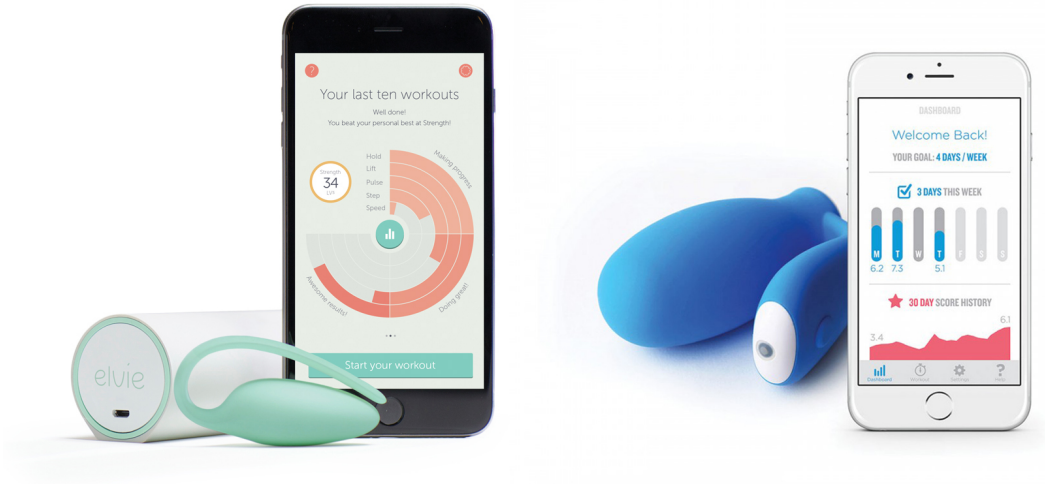


Figure 3: *Left)* Elvie (2015); *Right)* kGoal (2014)

In spite of the fact that self-tracking technologies that make accessible the continued monitoring of personal health proliferate, so do misconceptions and misunderstandings about intimate carework, and the intimate anatomy (Braun & Wilkinson 2001). I will explore how the design of wellness technologies that focus on intimate care, by evoking learning with and through body-worn interactions, can contribute to enhance practical or anatomical knowledge of the intimate parts of a woman's body. In doing so, I will explore a variety of approaches to gaining awareness of the body through wearable and digital interactions, and I will use humour as tool for engagement with such sensitive topic, in support of breaking the taboo.

2.4.2 *On-Body Technologies in Learning*

Wearables for teaching and learning that speak about and to the body vary in approaches that support and enable the construction of knowledge. I focus here on technologies that combine embodied learning and intimate self-discovery. Body literacy among school children is developed through exploring tangible "body organs" in (Norooz & Froehlich 2013, Norooz et al. 2015). This example explores engagement and learning with technology to stimulate knowledge of body organs that are "invisible and untouchable" by composing and mapping material representations of the body landscape. Furthermore, (Norooz et al. 2015) shows evidence of how such on-body approaches can successfully engage children in learning about anatomy and physiology by exploring wearable interactions.

Figure 4: BodyVis, Norooz et al. *Left)* 1st prototype (2013); *Right)* follow-up prototype (2014)

A wearable technology that embodies playfulness can be seen in (Wilde 2012), where a "body object" is used to perform in unexpected ways, with the self and in interaction with others, in order to compose sounds. This work can also be understood to enable learning about how bodies are particular in their morphology, material similarities, and differences from other bodies (Young 2005), as demonstrated by the amusement visible in each individual performance.

I take that qualities of body knowledge can be affected by topics of taboo, misinformation, and lack of self-awareness. The deconstruction of the female body in light of these qualities and the evidence that a wearable interface supports situated learning about the body, all the while, and nonetheless, through play and amusement, led me to consider the ways in which unconventional interactions can be negotiated with and through humour: a psychological state characterized by the positive emotion of amusement and the tendency to laugh (Martin 2006). Humour as a method of support in engaging an audience has been explored in the aforementioned (Wilde 2012), where an augmented body-device doubles as a musical instrument. Here, as seen in figure 5, the interface is primarily concerned with the body and its design interaction incorporates humour, which is instrumental in welcoming the social

Figure 5: hipDisk(ettes), Danielle Wilde, Swing That Thing (2007-2011)

awkwardness of core-body movement necessary to enact the interface as a sonic system. It is this embodied playfulness and humorous on-body interaction that benefit the managing of bodily awkwardness. Further, as we can see in (Norooz 2015), it contributes to promote access to learning, looking and talking about parts of the body. I argue that humour can also contribute to help diminish the taboo nature associated with learning, looking and talking about sensitive topics, such as intimate parts of the body, which I explore in this thesis.

2.4.3 *Humour in Care, and HCI*

While there are well defined cultural differences in the expression of humour (McCreaddie & Payne 2011), humour enables the expression of ideas which would otherwise be rejected, criticized or censored. It can facilitate communication, prompt amusement, and it has a disinhibiting effect (Ziegler 1998). In its review of humour theories, (Branney et al. 2014) refers to "humour as the enjoyment of the socially taboo". As a therapeutic tool, humour has been broadly discussed in health care. It is regarded as valuable for promoting patient-centered care (Scholl 2007) and coping with diagnosis and treatment of illness (Branney et al. 2014), positive for managing embarrassment (Meerabeau 1999), or advantageous for teaching (Ziegler 1998). Further, it is regarded as a method to support learning of sensitive topics (Johnson 1990).

The use of humour within HCI design is limited and most prominent work is recent. Most significantly, the taxonomy of humour as a design tool has been acknowledged and discussed in (Yu & Nam 2014), and humour-centered design was researched in (Delaney 2011). Whereas interaction design projects such as the hipDisk(ettes) or The Menstruation Machine (figure 6), a wearable device and design fiction directed at men/non-menstruating humans whom would like to experience 'the pain of bleeding' (Sputniko 2010), have contributed humorous probes, the attention given to designing with humour in ubiquitous and wearable computing is yet limited.

Humour as a design tool for enhancing laughter, fun, or users' satisfaction, as noted by Yu & Nam in (Yu & Nam 2014), remains underrepresented. Yu & Nam elicit nine principles to make products humorous, and these are: *shape incongruity*; *unconventional use*; *unexpected function*; *visualization of taboo*; *destructive play*; *bizarre consequence*; *zoomorphism*; *self-depreciation*; *abused product*. The range of methods these principles imply range from that of 'breaking proportion' to elicit the user's amusement; exploring the incongruity between the

Figure 6: The Menstruation Machine, Sputniko (2010)

expected use of the products and the actual situation of use; inviting users to attribute a new function to the products that they cannot anticipate from their appearance, and that will go beyond their expectation; making an aggressive use of a social taboo and destroying the norms; stimulating the user to get involved in a playful interaction with the products, which will lead her to break social rules in the process of 'operating their functions'; generating bizarre situations by user's active participation; making the user feel superior to the product; causing the user to break away from serious situations and by creating some funny or foolish situations; causing users to use the product in the process of product use. Moreover, humour-centered design as a strategy to communicate, extend positive discourse and enhance user experience has been explored in (Delaney 2011), a Master's Thesis with a focus on understanding "humour's function in design and to encourage the use of humour as a rhetorical device to undertake social problems." In contrast to (Delaney 2011) approach, but agreeable with what I consider to be significant and plausible as method to designing humorous interactions, (Benford et al. 2012) outline an opposing framework for what one would traditionally consider usability-focused interaction design, and labelled it uncomfortable interactions. As they describe:

"Uncomfortable Interactions are those that cause a degree of suffering to the user. This may be physical suffering such as physical stress, tiredness or pain, but might also involve mental suffering due to fear and anxiety, either experienced directly or empathically on behalf of others. Our core argument is that these kinds of uncomfortable interactions may be usefully

designed into cultural experiences, rather than merely being accidental side effects of them. This is not to say that the overall aim of such experiences is to create discomfort, but rather that uncomfortable interactions may be a useful 'means to an end'."

In this thesis, I highlight that uncomfortable interactions may be usefully designed into cultural experiences, and that they may be a useful 'means to an end'. I contend that novel interactive technologies have the potential to create new interactions and situations, some of which may start as unclear to users and participants, in regards to its norms and role expectations, however end up being beneficial and enabling. Nonetheless, a CHI '15 workshop titled 'Embarrassing Interactions' (Deterding et al. 2015) aimed at exploring embarrassment as a positive design goal. They recognize that "wherever new technologies disturb or merge situational norms and audiences, embarrassment is likely", and that 'uncomfortable interactions' can have powerful artistic, educational, and political effects.

2.4.4 *Caring Technologies for Women*

As I mentioned earlier, women's bodies have historically been a subject of taboo which as consequence has proven limiting to the development of women's health in general (Rossmann 2008). Literature shows that caring for intimate parts in women, such as the vulva and the vagina, renders difficult when we don't know how to name them properly or are inadequately informed about the appearance and function of these anatomy (Labuski 2013), or parts are not included in textbooks or are covered in sex education (Chalmers & Jones 2016). Here I turn to (Lupton 2014a) and her critical analysis of existing technologies, specifically mobile apps, which are useful, e.g. to keep track of ovulation and menstruation cycles and sexual activity. As she argues, such technologies risk to stereotype and "work to configure new norms of behaviour", or in the words of (Harcourt 2009), producing new "measures and analyses of the body in an array of strategies that then produce the modern sense of gendered individual and social subjects." While these tracking devices and services deliver an assessment of the intimate body and bodily functions and interactions in numbers, Lupton highlights the lack thereof a comprehensive understanding of personal and intimate experiences, i.e. the knowledge reflected by the technology does not account for e.g. body literacy, emotional intelligence or wellbeing.

Moreover, while the intimate body remains an 'uncomfortable' social and personal topic, the perpetuation of such a culture of shame, secrecy, and lack of awareness can be (broadly) damaging to genital integrity and health (Simonis 2015). While this discomfort might

contribute to the estrangement between women and their genitalia, "having the knowledge and ability to make bodily and verbal distinctions" (Labuski 2013) is critical to women's reproductive health and sexual wellbeing. While women still tend to avoid contact with genitalia that don't hurt (Labuski 2013), or talking about 'private parts' if it might "put 'sex' on the agenda" and lead to improper commentary (Braun 1999), much is left culturally misnamed and popular bodily imaginaries start to win over genital diversity and normal appearance (Deans 2013). On the other hand, clinical health care has also seen little technological breakthrough in both its interventions and devices. While accounting for the evolution in design of the vaginal speculum (Kapsalis 1997), the current technology used in gyneacological medicine, it is apparent that technologies for care within the body get their job done (Rossmann 2008) though perform poorly in what accounts for the experiences of the women upon which they are used. Furthermore, as studies show (Wright et al. 2005), a pelvic exam is a 'quick test' that nonetheless is considered to be unpleasant, embarrassing, fearful, painful, or uncomfortable by most women, impacting on the ultimate decision on whether to have it. Enabling choice, e.g. the design and availability of self-sampling devices, has already proven efficient within communities of women by helping non-attendees of the routine screening in "overcoming practical and emotional barriers to screening", as much as showing the potential to "increase screening attendance" (Karjalainen et al. 2016). Arguably, enablement can develop opportunities for change, including individual behavioural changes (Dombrowski et al. 2016).

2.5 Summary: HCI and Intimate Care as an Agenda for Change in Women's Health

While I recognize that technologies for women's health and wellbeing in HCI might be plentiful, I argue that technologies for intimate care are limited. This lack thereof gives me the opportunity to examine topics that have hindered research of intimate care within women's health. Technology use and design impacts the nature of the outcome, and by examining the asymmetry highlighted in the proposed ***qualities of intimate care*** within HCI research I open the discussion that places life disruptions, such as that of the body, as a future lens to relate to possibilities of designing technologies for intimate care in women. These qualities of intimate care – with their focus on conceptualizations of knowledge, esteem, and reliance of both the self and the other – and an associated lack of definition within HCI, are my point of departure to designing interactions for women's health within the field. This thesis considers all these qualities throughout its inquiry, which includes research and design for and with the intimate body, ultimately placing an emphasis on knowledge of the self and the other, as described below.

While everyday technologies (e.g. apple watch, mobile apps) already set to promote a healthy lifestyle and quantify wellbeing, I aim to explore ways in which technology can take part in a social-cultural shift towards the body in health and disease. In order to do so, I will highlight ***body literacy*** as a key consideration to designing technologies and interactions for and with the intimate body. I classify body literacy as a quality of intimate care. *Knowledge of the body* can impact and strengthen the promotion of protective health behaviours and advocate for prevention. I provided the example of a bodily practice of intimate care that I suggest could benefit of an HCI perspective on designing for knowledge: the design of medical gynecological instruments, such as the speculum. This is a device whose design features have been mainly developed at a time when the female body was not yet fully scientifically or anatomically understood. Hence, it can benefit both from enhanced body knowledge and advancements in technology. Moreover, reforming devices within institutional care practices might lead to empower people in increasing agency over their bodies and impacting the adoption of technology to transforming self-care. In taking this aspect of research forward, one that supports ***knowledge of the self and the other***, I will emphasize methods that explore making and embodied interactions. I do so based on my interest in exploring the design of on-body technologies, such as wearable computing, to prompt new ways to learn about the body. As noted in (Buechley & Perner-Wilson 2012), "the experience of making things by hand is an important part of being human" and different ways of doing can engage different kinds of people in creating technology. I will use (Norooz & Froehlich 2013) as an example that innovates in methods while keeping an user-centred design approach and using wearable e-textiles (electronic textiles). This results in a new approach to teaching and learning about anatomy and physiology while employing computational textiles to deliver an interactive experience of unseen "body organs". Like so, I will seek to combine making and wearable e-textiles as a form of raising awareness of the body. In particular, I explore such an approach to serve as catalyst for discussion around sensitive, embarrassing, taboo topics as described earlier.

I will contemplate ***humour*** as a positive approach for managing embarrassment, as discussed in (Meerabeau 1999), in that it is perceived as a functioning coping mechanism to deal with varied vulnerabilities in health and care, and that humour can alleviate mood and tension in situations that are delicate or restricted. Moreover, humour in women has been scrutinized as a means of social connection and resistance. It can provide a space for change, it represents a challenge to cultural forms in that it serves both social and subversive roles, and can be a catalyst for creative imagination (Naranjo-Huebl 1995). In contrast to laughter, "which occurs

in all cultures worldwide and is a universal component of the human experience", science believes humour represents "a rather complex higher-order emotional process" (Vrticka et al. 2013). "Humour can lead to positive emotion and is thought to serve important evolutionary socio-emotional purposes", serving to help us e.g. to communicate ideas, boost mood or cope with stress. Moreover, humour is conceived as a mode of discourse and a strategy for (gendered) social interaction (Crawford 2003), as is a powerful communication tool and potential change agent (Goldman 2013) used as, in the example of (Vitis & Gilmour 2016), a non-traditional form of resistance to gendered violence. Nonetheless, as we see in (Ensler 2001), wry humour also links women together through experiences of being woman in a certain – whether positive or less so - context, and through a sense of pride and fun in their bodies (Harcourt 2009).

Experiences that deliver a sense of fun while promoting knowledge of and care on the body are yet another aspect of the research that I will take forward. I will consider ambiguity and criticality in design (Gaver 2002, Gaver 2009, Pierce et al. 2015) to develop an artefact that will aim to ignite conversations around the self and other, and to embrace the body as a site of knowledge in the making other than measure (quantified self) only.

In this chapter I discussed concepts of intimate care in women's health, and advance a set of qualities as uncovered through the review. Design approaches taken in HCI are under-represented within this complex field of study, for which I highlight possible approaches to research and design that contemplate not only women's bodies but also account for their experiences in health and disease. I argue that body literacy is a quality of intimate care, and this thesis speaks to that construction of knowledge through inquiring technologies designed for, and that may enable the care of, women - by the self or other.

Chapter 3. A Woman-Centered Approach

3.1 Introduction

This chapter outlines my epistemological position describing a feminist standpoint to research through design developed to engage with aesthetic and critical approaches to bodily and women-centred experiences. The methodology has been developed specifically to understand the challenges and opportunities of designing technologies for women's health that account for intimate care in women. The methodology is rooted in feminist theory and related viewpoints regarding technology (Wajcman 2010, S. Bardzell & Bardzell 2011b, Rode 2011) and takes a critical-humanistic approach to HCI (Bardzell & Bardzell 2015) to position women's subjective experiences in health and disease within the context of intimate care in women's health. In this chapter, I introduce women-centred perspectives and empathic approaches to health care by placing a woman's body as a lens to relate to possibilities of future technologies for caring of women. To this end, the methodology is underpinned by a variety of approaches to design, to advance situated practices on women's bodies that embody lived experience, but that also position approaches to woman's health as demanding of justice, in that it regards bodily integrity and takes women's rights into perspective.

3.2 A Humanistic View of and Feminisms in HCI

3.2.1 *Humanistic research and practice within HCI*

Human-centered perspectives in HCI have grown to embrace "concepts such as aesthetics, user experience, enjoyment, and play (Bannon 2011)". Human centered approaches have helped place meaning within "understanding of people, their concerns, and their activities at the forefront in the design of new technology (Bannon 2011)". In doing so, it acknowledges the desire to reinvent the status quo of human-technology relationships and suggests a shift in focus regarding social, cultural, and political concerns and actions. Furthermore, critical-humanist approaches to HCI account for research concerned with designing interventions and interactions for everyday life, "including how they fit in technological, cultural, and environmental ecologies from the beginning to the end of their lifecycles (Bardzell et al. 2012)". To elaborate on this, (Bardzell & Bardzell 2015) recently offered a working definition of *humanistic HCI* as "any HCI research or practice that deploys humanistic epistemologies (e.g., theories and conceptual systems) and methodologies (e.g., critical analysis of designs, processes, and implementations; historical genealogies; conceptual analysis; emancipatory criticism) in service of HCI processes, theories, methods, agenda-setting, and practices." (Bardzell & Bardzell 2016) also put forward that HCI, as a (new) field, has no significant

histories, beyond a general sense that it has had three paradigms or waves (Bødker 2005, Bødker 2015), and most related design systems are presented with little to no reference to their historical genealogies.

Designing human-technology relationships with a humanistic approach thereafter encourages an openness to novel ways of thinking that can support research in sensitive topics and challenge lines of inquiry that are absent or even 'forbidden'. What I attempt to do in this thesis is to focus on the design of artefacts that will start conversations around intimate care in women's health by using technology-enabled materials and embodied perception as catalysts to learn, speculate, or intrigue. In this methodology, I look at the "capacities of digital interaction as a medium" to design for and with the female body, while "explicating relationships between design choices and experiential qualities" (Bardzell & Bardzell 2016). Furthermore, disciplines of design are largely grounded in the Arts and Humanities, therefore bringing a set of concerns that include aesthetics, a consideration of technology products as cultural artefacts, and an interest in situated practices (Pierce et al. 2015).

3.2.2 *Humanistic by design: the feminism-technology connection*

In looking for ways to design experiences and interactions for women, I aim to engage humanistic approaches to the body and digital as mediums. If HCI is a new field, and historically and culturally technology has long been defined in terms of male activities (Wajcman 2010), the opportunity gap to redesigning technologies for gender equality is pressing. Within this thesis, I will focus on the design of technologies for the intimate care of women by approaching the topic from a conceptual/critical designer's perspective. In taking a feminist approach, I am reflecting on my experience and background as an artist and designer engaging with expressive wearable technologies, which I see linked to a humanistic approach within technology. In this sense, the feminine technologies discussed throughout this thesis are embedded with aesthetic qualities and a critical viewpoint to bodily and women-centred experiences. In exploring material and physical engagement, I aim to advocate for feminist-oriented approaches, to designing tools and promoting literacy that improve the conditions of women, within the social endeavour of (self-) care.

The crossroads of feminist thinking and theory with HCI research has been defined as Feminist HCI by (Bardzell 2010, S. Bardzell & Bardzell 2011b). As a cross disciplinary area of research, feminism in HCI engages practices such as interaction design (Bardzell et al. 2011), social computing (Steinhardt et al. 2015), and varied other synergetic topics of inquiry (Bardzell & Churchill 2011). Moreover, feminist perspectives of, and approaches to, what

technology is have contributed to gendering agendas within the field (Fox et al. 2015). By "broadening the concept to include not only artefacts but also the cultures and practices associated with technologies" (Wajcman 2010), it makes clear how much gender and technology are shaped by each other if embodied in a "socially-situated, everyday practice" (Rode 2011). Gender, as discussed by Rode, is inherent to technology and gendered doing is an element of design and "we as designers need to have agency in its gendering".

In her introduction to *Feminist Technology* (Layne et al. 2010), Professor of Anthropology Linda L. Layne starts by defining feminist technology as tools plus knowledge that enhance and extend women's ability to develop, expand, and express their capacities, to contend that such definition narrows the debate around whom is woman and the range of sociotechnical systems for change. Furthering on that, and adding an ethical lens, (Johnson 2010) argues that a feminist technology is a technology that favors women in some way, however noting that it cannot only be understood as a technology "that addresses women or women's needs because that is meant by "feminine" technology" (Johnson 2010, pag 42). According to Johnson, a feminist technology is a technology that is designed, developed, or evolved (through users) with women's involvement or at least with women's rights and interests in mind, and it is always an improvement over prior gender-inequitable social relations. In exploring concepts of feminist technology, I attempt to engage with feminist HCI and feminisms and gender in HCI as put forward by (Bardzell 2010, S. Bardzell & Bardzell 2011b) and (Rode 2011) respectively.

As a further matter within HCI research (Cassell 2002) argues that designing for women risks ghettoizing them, to which (Rode 2011) advances that, on the contrary, the risk lies in designing technology explicitly for women. Feminine technologies, she claims, can be used by both men and women even if the design qualities are gendered as feminine. Moreover, Judith McGaw, an historian of technology, has looked at feminine technologies by looking especially at the relations of technology and women by virtue of their biology (McGaw 1996). Certainly, McGaw claims to abbreviate feminine technology to mean "modern, Western, predominantly American, feminine technology", and those she describes include body-worn technologies such as bras or tampons, and socially and culturally embedded domestic objects such as kitchen utensils or sewing needles. These "real" technologies came to be identified as artefacts associated with the private, feminine aspects of culture (McGaw 1996), as counterpoint to those that are thought to be masculine:

"Human-made, material objects used by men are called technology; human-made, material objects used by women are referred to as tools or utensils or appliances. Domains of knowledge and skill mastered by men are called technical or technological while those mastered by women are considered crafts." (Johnson 2010, pag 37)

I'll make the assumption that the technologies primarily referred to in (Rode 2011) envision mainly those "often associated with masculinity" in Euro-American culture (Johnson 2010). In this methodology, however, I am interested in overall categorizations that consolidate possible feminine approaches to contribute to developing feminist technology design and research methods by relegating such persistent stereotypes.

For the purpose of this thesis I contend that designing for women, specifically for HCI and intimate care in women's health, is disengaged with ghettoization rather it is critical to redefine and rescript women's bodily experiences of care. As I will discuss in Chapter 5, the gendering of technologies can be understood as not only shaped in design, but also shaped or reconfigured at the multiple points of consumption and use (Wajcman 2010). Moreover, in designing feminine-feminist technologies I aim to 'artfully integrate' design practice and its objects in ways that may reconfigure its use, mostly by women and open to men, but with women's rights in mind. As the World Bank estimates that the number of females worldwide constitute circa half of the global population (World Bank 2015a), and e.g. transgender reproductive health is a women's health issue (Hartofelis & Gomez 2013, American College of Obstetricians and Gynecologists 2011) there are challenges to designing technologies for this spectrum of the society, i.e. over half of the world's population. As I describe in Chapter 2, technologies for caring of women's bodies have been appropriated or derived from those originally conceived for and with knowledge of men's anatomy (Munch 2006).

Technologies that might be looked at as feminine and/or feminist are, to put it simply, technological innovations that might enhance women's lives. Similarly to (Bronet & Layne 2010), I recognize "that women are not a homogeneous group and that they have different needs and desires", and that they find themselves in a wide range and varied circumstances. Moreover, moving from "certain technologies being considered feminine to certain technologies being considered feminist", (Johnson 2010) argues, is filled with complexity and therefore it might be difficult to give a simple yes-no answer to the question whether a system is feminist. Johnson argues that feminisms and different viewpoints on feminism may produce distinct sociotechnical systems depending on whether they are about improving the conditions

of women, they have a focus on gender equality, or favor women rather than equalize them. In Chapter 7, I discuss how Labella, a sociotechnical system originally designed for women, was used in an intimate relationship of binary woman/man within a couple. This technology, which aims at benefiting women by promoting their intimate bodily knowledge, is also trialled and shaped within systems of knowledge that, in the specific case, involves enacting a gendered system in the context of gender relations.

In designing a technology that attempts to enable a woman's knowledge, i.e. enables her to engage in her own development (Young 1990), it does so by empowering her to look and know more about her intimate body. The opportunities that arise with such design is that it can nurture and encourage knowledge of the other, whether in conversation with other women who might have experienced the same system, or within a couple, by discussing e.g. differences in anatomy. Nonetheless, such enablement creates possibilities for change and can foster human capacity (Dombrowski et al. 2016). In other words, I argue that technologies as such are well positioned to promote gender justice and have an impact on areas of women's health and wellbeing that may still be currently neglected due to persistent stereotypes or taboo.

3.3 Beyond Empathy

3.3.1 *Situating A Women's Health Approach*

> *"A woman-centered approach to health is a human rights-based approach that seeks to ensure that every individual has access to basic health, education, and other social services, including sexual and reproductive health" (McKean 2010)*

Ideas about the female body have changed across the years, both in western law and biological theory (Weitz & Kwan 2014), and similarly did medical knowledge. Medical knowledge has come to both describe and construct "the body as an invariant biological reality" (Armstrong 1983), as this knowledge has increasingly been concerned with the subjectivity of experience. In taking that technology results from the combination of artefacts and social practices (Johnson 2010), and here I will focus on the social institution and systems of knowledge, it is critical that advancements within adapt and conform to contemporary knowledge of women's bodies. Historically, the existence of gender bias and disparities in women's health care occurred based on the fact that " biomedical research findings on women's health issues were based on male subjects and later generalized to women" (Munch 2006). Obtaining justice in women's health care became eminent with the women's

movement of the 60s through early 80s, which contributed to bringing awareness to such inequalities, as varied as reproductive freedom to pay equality, to the foreground. The impact of feminist knowledge in, for example, gender bias diagnosis which most commonly occurred in relation to women's reproductive system, has seen a push towards medical knowledge that reflects women's reality (Munch 2004)**.** Stereotypes about women's nature and women's bodies, in tandem with knowledge originated from the standpoint of male physicians and scientists, had contributed to generalizing theories of the body from men to women.

Significantly for this methodology, the necessity of creating feminine-, feminist- feminism-technologies stands for the chasm between knowledge and misunderstandings of the female body, not only in regards to its anatomy, but also its relation to 'felt experience' as body-in-the-world. Drawing from lived experience, feminine technologies unveil technological choice and technological knowledge to be pervasive as users of said technologies are empowered to handle or control them. Such capacity and expertise should be "enough to contribute intelligently to any discussion of technology policy" (McGaw 1996). More so, the emergence of such technology has impacted health and care in the recent few decades, and such feminine- feminist technologies, such as the pill or the home pregnancy test, whether or not controversial (Layne 2010), have changed the way women experience sex or pregnancy. Moreover, as these technologies are designed to mediate or manage women's bodies, the social politics inherent to some of them, e.g. the breast pump, a device that continues to be regulated in public or even the workplace (Boyer & Boswell-Penc 2010) and, much like the speculum, seems to be poorly designed (Ignazio et al. 2016), open up questions to whether these technologies are positively contributing to women's autonomy in health and self-care. Engaging with these technologies require, to a significant extent, knowledge of the body. As I discuss in Chapter 7, body literacy of intimate parts of the body can have an impact on e.g. managing menstruation or sexual health. Nonetheless, just as significant, policy and laws that make some of these technologies more or less accessible, e.g. the pill, and institutional dominance that regulates and determines changes or adequacy in services and e.g. medical devices, can contribute deeply to gender justice and women's rights. While advances in medical technology do occur so does an increased medicalisation of women's health - medicalised by the pharmaceutical industry and politics (Conrad 2013, Wardrope 2015, Halfmann 2011). De-medicalising health (Yates-doerr & Carney 2015), e.g. reproductive health and related reproductive technologies, may render the woman more autonomous over her own body/life (Lombardo 2015). As agents of social influence within the binary doctor/patient, and gatekeepers to medical knowledge, medical practitioners are key in this

process of social change. Understandings of a woman's intimate body need not only take place within a clinic, as I discuss in Chapter 7. If women have access to e.g. technologies that can communicate to and with them through their subjective experiences or circumstances, maybe women can feel more empowered in their self-care, in health and disease.
Not only do women represent more than half of the global population, women and girls comprise the largest disadvantaged groups in a population. Health policy may acknowledge that reducing gender inequities is required, all the while looking at each woman as an individual (McKean 2010). Designing technologies that make accessible topics of the body, such as those that are intertwined with taboo and misinformation, through the lens of Humanistic HCI, in which it involves communicative competence, imaginative empathy, and reflective self-awareness, is needed and desirable.

3.3.2 *An Empathic Relationship*

Empathy and experience in HCI have been extensively researched by (Wright & McCarthy 2008, McCarthy and Wright 2015), empathy understood as a necessity in moving from a focus on system functionality to a more humanistic perspective on design (Thieme et al. 2013). A number of methods, including ethnography and ethnographic approaches (Hammersley & Atkinson 2007), participatory practices (Light & Akama 2014), empathy probes (Mattelmäki & Battarbee 2002) or cultural probes (Gaver et al. 2004) have been implemented in user studies or created and deployed in contexts in which users engage with designed artefacts in everyday life.

As argued by Peter Wright and John McCarthy, an empathic approach extends to include and build on inspiration achieved from a rich understanding of people's experiences and life contexts, with the purpose of developing "through a meaningful emotional encounter between designer and user". An empathic methodology carries through after fieldwork and engagement with the participants to give expression to participants' experience in the analysis. This is what I attempt to do in Chapter 5, in which I 'translate' my field notes into writing, while participant-observing the practice consultation of a women's health physiotherapist at the local research hospital, and the bodily experiences and responses between those involved, physiotherapist and patients, in order to give expression of felt experiences by them in a consultation room. In doing so, I am interested in highlighting current practices and devices in use for intimate bodily care in a professional setting, and also in conceptualizing an agenda for change in women's health, one that stresses the demand for intimate care and which advocates for designing technologies with an emphasis on gender

justice. As a woman myself, I cannot but question whether current technologies for my intimate care within a clinic ought to be more advanced then they show to be now. In conversing with the women's health practitioner she ends up echoing my impressions. In hindsight, it is no wonder that, as I see a variety of bodily interventions happen on someone else's body, I felt an increased sensitization (Moncur 2013) towards my own health and body.

3.3.3 *Social Justice and Technology Design*

While "empathy has been used as a defining characteristic of designer-user relationships when design is concerned with user experience" (Wright & McCarthy 2008), the 'user' within women's health practices is both giving and/or receiving care. As I discuss in Chapter 5, a health practitioner uses institutionally approved medical devices as tools to manipulate the patient body, and has been trained in and given those tools by the regulatory body of said establishment. A patient is generally accepting (or expected) to abide with such procedures in and on her body, being caught up in a biopolitical power play that seems to them, practitioner and patient, a natural order of things (adapted from example in (Harcourt 2009) page 21).

I use the example above to argue that most technologies configure their user as a consumer and not as an active participant, and that empathic methodologies in the design of technologies need to take bodily integrity and rights into perspective. Technology design for the body should enable those at 'both ends of the spectrum'. Enablement centers not just on facilitating action, but also on deciding *which* actions to enable (Dombrowski et al. 2016); It is applicable in a variety of domains in which individuals develop their own capacity. This capability approach was pioneered in development economics by Amartya Sen and appropriated by American Philosopher Martha Nussbaum, who then attempted to create "a list of ten capabilities as central requirements of a life with dignity" (C. Nussbaum 2000, Nussbaum 2000). Most importantly for this methodology, she describes the capabilities of *bodily health,* which includes "being able to have good health, including reproductive health"; and *bodily integrity*, which among others include "having opportunities for sexual satisfaction and for choice in matters of reproduction". I contend that having the capacity to provide for one's own (or other's) bodily health and integrity requires access to, and involves knowledge of, the body as delivered in an educated and timely fashion; empowerment, to have a choice and to consent in an informed manner.

"Social justice entails democracy, in that it acknowledges social equality as recognition and affirmation of group differences (Young 1990)", a conceptualization which, for the purpose of

this thesis, I will use to refer solely to women and girls as one of such groups as we comprise the largest disadvantaged group in a population (McKean 2010). Power is immanent in everyday relationships, e.g. knowledge relationships, and critical-humanist approaches to HCI account for research concerned with designing interventions and interactions for everyday life, "including how they fit in technological, cultural, and environmental ecologies from the beginning to the end of their lifecycles." Design is inherently about sociotechnical change, affording new practices, social habits, and ways of living and interacting (Dombrowski et al. 2016). In line with humanistic approaches in HCI, design ought to be more appropriate, crossing borders of knowledge and experience, and meet needs beyond the functional to create and promote positive experiences.

3.4 Designing for and with Woman

In aiming to understand and be inspired to designing interactions and tools that promote intimate care in women, I venture into designing and applying innovative methods and approaches that facilitate and mediate knowledge of the body through artefacts and social engagement, between communities of women and the woman in private *(which, by definition, can include an intimate partnership)*.

In this thesis, I draw from a diversity of approaches to research through design that I will discuss throughout this section.

3.4.1 *Woman-Centered Design as Inquiry*

As noted by (Gaver 2012), over the past years an increased number of design practitioners within HCI has contributed to the merging of practices of design that include a variety of methods and conceptual viewpoints. Research through design, as it has been defined within the field, is work that mostly takes the form of artefacts and systems (Zimmerman et al. 2007), and also challenges status quo thinking about design research artefacts to include rather conceptual and material studies or design proposals as alternative formats to present the contribution of knowledge (Pierce 2014). Moreover, a critical-humanist approach to designing within HCI advocates for novel ways of thinking about research interventions and interactions for everyday life that, supported by technology-enabled materials and embodied perception, will advance knowledge and spark curiosity. In looking at research through design as a resource for the production of new knowledge (Storni 2015), and its speculative essence which manifests in explorations of new and conceptually rich artefacts (Gaver 2012), I draw from a number of approaches that include critical and speculative designs that implicate

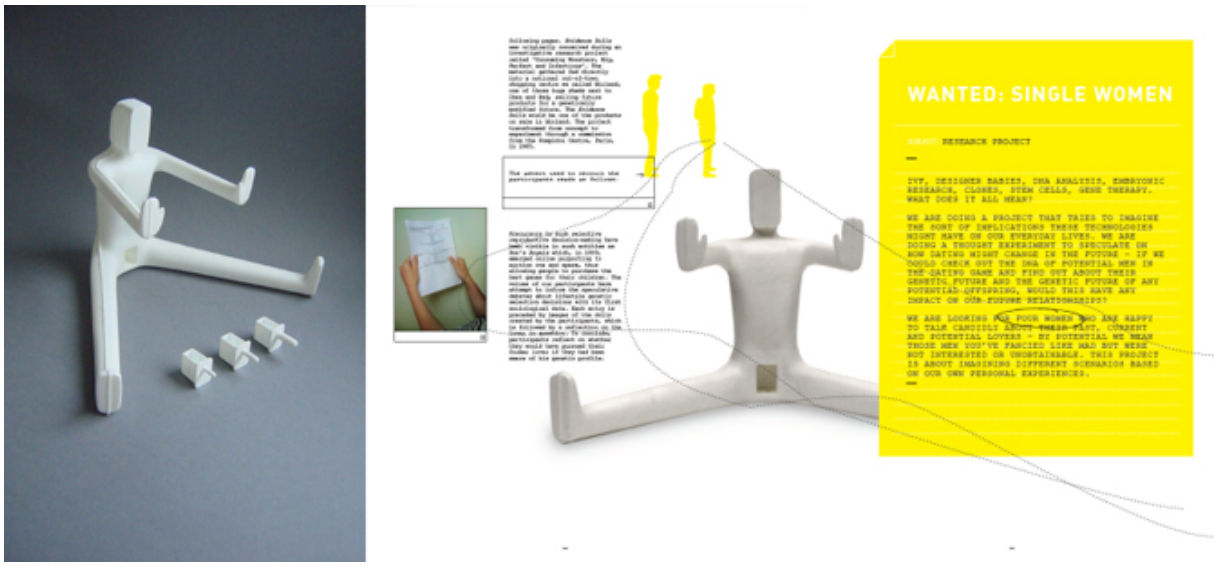


Figure 7: Evidence Dolls, Dunne & Raby, 2005.

women, their bodies and experiences, for example Evidence Dolls by Fiona Raby (figure 7)(Dunne & Raby 2013) and the Menstruation Machine by Sputniko (2010), or technology probes (Hutchinson et al. 2003). In drawing from such a diversity of approaches, I aim to produce designs that can contribute to shape and strengthen knowledge, as part of the design intention and outcome (Pierce et al. 2015).

As I noted earlier in relation to health care in gender equality, it is pertinent to look at each woman as an individual when accounting for the fact that each and every woman may find themselves in a wide-ranging and varied circumstances, or have a distinct range of subjective experiences. Situated practices are characteristic of design, as is a consideration of technology products as cultural and social artefacts (Pierce et al. 2015). As I discuss in Chapter 7, situated practices on the body through and with technology show to enable or empower women in distinct ways, and may depend on their socio-cultural or professional circumstances.

In the case study I introduce in Chapter 7, I also discuss humour as a tool and method for breaking barriers of taboo, those of the intimate body. Characteristics of humour in women (Crawford 2003) and its positive accounts in health and care (Meerabeau 1999, Scholl 2007, Branney et al. 2014) have shown that this approach can be employed as support in vulnerable situations. Moreover, humour in design and interactions (Yu & Nam 2014, Wilde 2014) can also contribute to enhance engagement, and become an opportunity for embodied learning and embodied discovery.

3.4.2 *Design and Gendered Artefacts*

Design artefacts have inevitably been part of the "relatively young academic tradition of HCI Design (Pierce 2014)". For the purpose of this thesis, I will borrow Pierce's definition of design artefact, that it "is a material outcome of a design process (Pierce 2014)". Examples of said artefacts include notions such as prototype, sketch illustration, or toolkit. In Chapters 6 & 7, I will introduce and discuss a set of design artefacts that include 1) a design toolkit as a research instrument deployed with study participants, 2) a research artefact that was deployed within a study as a working design prototype, i.e., a technology probe (Hutchinson et al. 2003); robustly implemented and operational artefact capable of being deployed *in situ* (Pierce 2014).

As material outcomes of design processes, the design of systems and sociotechnical artefacts continue to disregard or embed gender-aware approaches to innovation in technology. As noted in (Rasmussen & Petersen 2011), researchers in interaction design have acknowledged that there is "a blind spot as to how gender differences affect what people care about, what motivates them in everyday lives and the way they desire to live with technology". Within design studies and design research, critical design has served the purpose of reinvigorating discussions of design as a method of cultural provocation ((Malpass 2013) cited in Pierce et al. 2015), or as a starting point for discussing how social issues and political themes might enter design practice ((Mazé & Redström 2007) cited in Pierce et al. 2015) . I contend that social issues and political themes as mentioned ought to include body politics and gender equality. One such gendered critical design example is the 'Andro-Chair' discussed in (Sundbom et al. 2015). This "design concept aims to portray a conceptual male equivalent to the contemporary gynaecology chair" used, in the aforementioned case study, in Sweden, but nevertheless the standard gynaecology chair also used in a large part of the world. "Viewing the patient from a gender neutral perspective in a society which is not gender neutral is a sign of gender blindness, and does not lead to equality (Sundbom et al. 2015)".

Figure 8: The Andro-Chair, Sundbom et al. 2015

Moreover, the overlap between the practices of critical and speculative design "are subtle and based primarily on geographical or contextual usage (Auger 2013)", after which Auger suggests that the choice of 'speculative' is advantageous as it indicates an interconnection between 'here and now' and existing design concept. Drawing on that, the concept of feminist speculative design has been advanced by (Prado de O. Martins 2014), as an approach that aims to question the relationships between gender, technology and socio-cultural oppression e.g., gender violence and discrimination. As "feminism recognizes and builds upon (diverse) women's creative resistance to oppression (Harcourt 2009)", power within the body is both a site of social experience and political resistance (Grosz 1994); bodies are fluid sites of power and political contestation (Foucault 1979).

Nonetheless, design can be a tool for oppression, e.g., "the recent wave of unnecessarily gendered products" (Prado de O. Martins 2014) that promote gender stereotypes and not necessarily contribute to an agenda of gender equality. However, design is and can be "an effective tool for social change", and its "peculiar, fluid position as a discipline capable of benefiting from both humanistic and scientific knowledge has long been one of its most distinctive traits" (Prado de O. Martins 2014), as much as material objects can be social agents (Oudshoorn et al. 2002). Methods that afford the possibility of inventiveness towards gender awareness can contribute to designing future artefacts that, by incorporating a gender script, can shape and define agency of all sexes (Oudshoorn et al. 2002). Moreover, "gendered relations are certainly among the social relations that artefacts embody and convey" (Oudshoorn et al. 2002), and artefacts are produced through addressing methods to a specific problem and the capacity that emerges from the use of that method to change the problem (Lury & Wakeford 2014). Furthermore, an 'inventive method' addresses a specific problem, and is adapted in use and in relation to that specificity; its use may be repeated, but the method is always oriented to making a difference (Lury & Wakeford 2014). As I will discuss in Chapter 6, methods that afford the possibility of inventiveness can encompass varied *material outcomes of design processes* – artefacts, devices, objects – which can serve as a method of speculation or strategy to thinking about use (wear and body built, in the specific case) and situated experience on the body. 'Doing' enables different concerns for embodiment, emotionality, and situated enquiry otherwise overlooked (Rosner et al. 2016), and the experience of engaging with the making of material objects contributes, in this sense, to engaging in more intricate issues (Ratto 2011). Generally defined, experiences are far more effective tools for provoking estrangement, discomfort and, ultimately, reflection (Prado de

O. Martins 2014). To sum up, gendered artefacts should not need to be "products in pink boxes" (Cassell 2002) just as much as such conceptualization does not mirror that of feminine or feminist technologies. What I am interested in, with this thesis, is to inquire how artefacts can offer the woman better (self-) care, providing that sociotechnical systems account for their lived body experience, all the while by exploring designs that are favourable to a woman-centered methodological approach.

3.4.3 *Epistemic Objects*

Recent debates in the fields of Research Through Design, practice-based research and the Digital Humanities (Ramsay & Rockwell 2012, Niedderer 2007, Gaver 2012), have pointed at the co-existence of different kinds of knowledge, challenging the traditional scientific approach to research and introducing alternative logics of dissemination and validation. Variably defined as tacit, experiential, non-conceptual, non-propositional, in action, situated, and even ineffable, these new notions of knowledge are contributing to the introduction of not only new research methodologies but also alternative epistemological conditions.

As noted by (Young 2005), "the lived body is particular in its morphology, material similarities, and differences from other bodies". Similarly, Shildrick's notion of the body as fabrication and inconsistent artefact is suggestive of a productive parallelism between the fluidity of the body and the non-fixity of designed objects (Shildrick 1997). The process of redesign implies that artefacts, even when established in practices of use and after a long-lasting presence in the marketplace, cannot achieve a stable condition. In a way, all designed artefacts can be as potential prototypes for redefined versions of themselves. The case of medical devices however is made complex by their embeddedness within determined scientific system, guidelines and rules. These devices relate to the body as much as they relate to fixed parameters and measurements. In this context it is instructive to explore the Karin Knorr-Cetina approach to the objects of scientific research (epistemic objects), that contribute to a broader strand of literature questioning the absolute and objective nature of scientific knowledge (Kuhn 2012, Latour & Woolgar 2013, Barad 2007). Epistemic objects are intended as inherently incomplete and constantly unfolding because of their relationship with the evolving nature of research, and their capacity to generate questions and develop new problems and responses.

In parallel to a redefinition of knowledge, the design process of any technological device is also subject to changing value and cultural systems. Literature on Science, Technology and

Society (STS), with its focus on issues that relate to the opportunities afforded by the technological and social to produce cultural transformation, has thoroughly addressed this reciprocity (Callon et al. 1986, Bijker et al. 2012), but Akrich's notions of script and re-inscription are particularly relevant to describe the process in which both designers and users attribute values to the device, shaping the device itself (Akrich 1992). While script is intended to what users are asked (from the designer) to imagine about a specific device, re-inscription consists in a feedback movement that introduces conflicting visions on the object, not initially foreseen by the designer. The dynamic between inscription and re-inscription can be adopted as a framework to understand how participants and designer can collaborate in shared knowledge to inform and advance body politics in health and care. As I discuss in Chapter 5, tools and devices that can facilitates knowledge and agency in self-care and/or care by others, can benefit from renewed forms of biopolitics and power (Foucault 1979).

3.5 Summary: A Woman-Centered Approach

"A woman-centered approach does not ignore or diminish the health needs of men and boys, but rather recognizes and addresses the disparate needs and conditions of women" (McKean 2010). In line with this conceptualization, which is a component to an American governmental health policy, the development of the methodology was driven by my desire to tackle the apparent lack of HCI research and design in women's health. My motivation in choosing to draw from this particular area is the emphasis on the lived body (Grosz 1994, Loke & Robertson 2011) to explore how practices and tools of (self-)care can be (re)designed in ways that support and improve bodily and women-centered experiences and conditions. Moreover, in implying that the female body is of global concern, a woman-centered approach embraces notions of women's bodies, in their fluidity and in their specificity, to assist in sociotechnical change and technology design that traverse knowledge and experience to accommodate positive experiences.

As HCI continues to evolve as a discipline and fields of research expand to include inter- and trans-disciplinary approaches to design, I have focused on inclusive and distinctive methods to design for the (woman's) body as a site of care. I engage with concepts of feminist HCI and gender in HCI to expand on and advocate for feminist-oriented approaches to design and research within the field. In doing this I address stereotypes and highlight topics that have been neglected due to taboo, so that this body of work pointedly contributes to designing technologies for the health and wellbeing of women in ways that shape and strengthen knowledge.

In attending to my initial research questions, understandings of how women's health is understood in HCI and the impact that has in the design of technology and interventions show to be crucial in order to have the topics discussed and designed for. By emphasizing this absence and attempting to put forward an agenda the research addresses this gap. Moreover, methods that can be used to support women's health within HCI and inform the design of caring technologies for women can benefit from innovative approaches that not only engage all women in the design intention and outcome but also in the process. The woman-centered methodological approach introduced here intends to convey that, in practice evolving throughout the woman-centered inquiry set at the heart of this research, as discussed in Chapter 5 and centered within the research through design outlined in practice on Chapters 6 and 7. Setting this methodology in motion, the challenges and opportunities of designing for women's health and how these technologies can enable care of the self and the other will continue to be explored in these chapters.

Chapter 4. Woman-Centered Approach in Practice

4.1 Introduction

In the previous Chapter, I outline the methodology and suggest approaches to designing for and with women. As I discuss in Chapter 2, intimate knowledge of the body and advancements in technology can prove beneficial to health and wellbeing. The humanistic and feminist-oriented approaches introduced in Chapter 3 inquire and reflect on the opportunities for a woman-centered methodological approach to HCI design. Through this critical lens, I suggest woman-centered approach as one to make justice to women's lived body experiences. In this Chapter, I give an overview of the methods that support this approach throughout the three epistemological chapters. This selection of methods reflect the specificities of the study in question and the sensitivity of not only the subject matter but also that of the subject in question, each and every woman. The three epistemological studies include 1) Chapter 5. *Intimate Care Work:* This is an observational study and data collection was completed between February 2014 and September 2014, while observing the practice of one Clinical Specialist Physiotherapist in Women's Health, Therapy Services at the local NHS research hospital; 2) *Chapter 6. An eTextiles Toolkit:* This includes the design and deployment of a novel set of creative materials, and data collection was done between December 2013 and March 2014. The toolkit was delivered within a series of design workshops with different communities of women; and 3) *Chapter 7. Labella:* In response to observations (Chapter 5) and design workshops (Chapter 6) I designed a technology probe, Labella (Chapter 7). Data collection was done between January and March 2015 (women only) and between June and August 2015 (couples).

4.2 Ethical Approval for the Research

In regards to the clinic observations described in Chapter 5, the process undertaken to access this women's health clinic, based at the local NHS research hospital, started in June 2013. This included first, meeting Dr. Paul Hilton, medic Gynaecologist and Urogynaecologist with the Newcastle upon Tyne Hospitals based at the Women's Services, Royal Victoria Infirmary, followed by meeting his team of women's health physiotherapists at the hospital. After our initial conversations, and based on initial research interests and possible future directions, we established that I would be sitting in within the consultation, once granted 'Observer Status' by the Trust.

This Observer Status in Therapy Services (Physiotherapy) was granted for the purpose of gaining experience and knowledge to support my course of study. It afforded me access to the clinical facilities and professional activities in the department or the Trust's hospitals as determined with Dr. Hilton and his physiotherapy team, and one of the Clinical Specialist Physiotherapists acted as my supervising consultant. In order to be granted this Observer Status placement, I had to provide all the required documentation that satisfy the requirements as defined by NHS Employment Check Standards and the Trust, which included adhering to the Trust's Confidentiality of Medical, Employment Records, E-Mail and Internet Usage Statement. After confirming in writing my acceptance of the arrangements as described, and the necessary follow-up with Human Resources based at the Freeman Hospital, I started attending the clinic. During the consultation, the Clinical Specialist Physiotherapist would ask each and all the patients, while in the waiting area and before entering the room, if they agreed in having me sitting in throughout the appointment and observing the practice.

The study described in *Chapter 6: An eTextiles Toolkit,* which involved a series of design workshops with small groups of women and girls, was approved by the Faculty Ethics Committee (Full Ethical Assessment by the Faculty of Science, Agriculture and Engineering Research Ethics Committee, Newcastle University). Participation in the research was entirely voluntary. The invited participants were given information verbally and in person, and via an information sheet which was accompanied by a consent form that they were asked to complete, sign, and return to me prior to the workshop. An information sheet and opt-out form for parents was also delivered to the students at Gosforth Academy (site of the first workshop) to take home, so that parents decide if they wanted their child to participate or not. If it was the case parents did not want their child to participate they signed the opt-out form and returned it to me either through the included stamped addressed envelope, or via the child or child's school. Prior to the workshop I also solicited consent from the child who, if happy to take part, was also asked to sign a consent form. Moreover, if deciding to take part, a participant was free to withdraw at any time, without giving a reason. A decision not to take part, would not affect her in any way at the time of the study or in the future.

Similarly, the process of obtaining ethical approval for the research presented in *Chapter 7: Labella* involved ethical approval by the Faculty Ethics Committee (Full Ethical Assessment by the Faculty of Science, Agriculture and Engineering Research Ethics Committee, Newcastle University). Participation in the research was entirely voluntary, and the invited participants were given information verbally and in person after my initial contact. An

information sheet was accompanied by a consent form that they were asked to complete, sign, and return to me before or at the same time I gave them the necessary materials kit for deployment. Again, if deciding to take part, a participant was free to withdraw at any time, without giving a reason. A decision not to take part, would not affect her in any way at the time of the study or in the future.

4.3 Participant Observation and Recruitment of Participants

Observations

Over a period of eight months (February 2014 to September 2014), I spent a total of 18:30 hours observing the practice of one Clinical Specialist Physiotherapist in Women's Health, Therapy Services at the local NHS research hospital. A total of nine sessions were scheduled, two of which were later cancelled due to unexpected health matters. Sessions varied in duration, ranging from four and half hours to two hours. On average, I observed between four to six appointments in one day. This fieldwork allowed me to familiarize myself with current medical practices, assistive devices in use, approaches in dealing with patients, and a general knowledge of a wide range of medical conditions that relate to pelvic health care in women. During the observational study, 31 consultations were observed, 30 of which were female patients and one was a male patient. The standard time of an appointment was 20 minutes.

Design Workshops

A total of 22 women participated in the study that I describe in Chapter 6. All participants were recruited to elicit as great a variety of age range as possible and included, among others, teenagers and mothers. The age range was 15-52 years old. The study included four workshops and participants were a group of six female participants, aged 15-16, at a secondary school in Gosforth, Newcastle; seven women at The Angelou Centre in Fenham, Newcastle; two workshops that took place in Culture Lab with a group of five women, aged 27-35; and four women, aged 40-52.

The contact with the secondary school had been established through Open Lab and Jacqueline Farquhar (Jackie), who is Head of PSHCE (Personal, Social, Health and Citizenship Education) at Gosforth Academy; meeting Rosie in person, the director of The Angelou Centre, early 2013 in a workshop organized by Rachel Clarke at Culture Lab; via email, flyer, and word of mouth for sessions which age range had been established to be 20s-30s and 40s-50s. An attempt to involve women aged 60 plus was made, by visiting them in their home, distributing a flyer, and inviting them to participate. This tentative recruitment took place in

the neighbourhood of Brunton Park in Gosforth, and was centered around women whom Ko-Le Chen, a fellow researcher who accompanied me, was familiar with by way of her mother and having lived in the area. Regrettably, she would later receive a handwritten letter from one of her neighbour friends, who had previously offered to host the gathering workshop in her home. The women apologised for not being able to participate in the study due to mobility issues, health matters and other appointments.

Participants were recruited for two sessions, 50 minutes each (students at Gosforth Academy; two sessions, one and half hours each (women at The Angelou Centre); one session, one and half hours total for 20s-30s group; 40s-50s group (mix recruitment within the University, workshops held at Culture Lab).

Individual Deployments

A total of fourteen women ended up participating in the study designated for women only, and a total of five couples participated in the study aimed at intimate partners (Chapter 7). As I intended to, the fourteen women elicited as great a variety of backgrounds as possible and included, among others, mothers, Yoga and Pilates instructors, an anthropologist, a dancer, women's health physiotherapists, designers, and a marine biologist. The age range was 25-63 years old. Similarly, all participants in the study with couples were recruited to elicit a variety of 'relationship statuses', i.e. couples who have had recently started their relationship through couples who have been together for a longer period of time, are married, and with or without children. The age range was 21-46 years old. My primary contact with all five was the female partner in the relationship (all five are heterosexual couples), who then invited their partner to participate in the study.

4.4 Data Collection

Data collection approaches were diverse and varied from case study to include a range of physical material and digital engagements by different women, who were involved in the research at different times. In 4.4.1, I allude to methods to observe professional approaches based on empathic skill and intimacy. Due to the context and intimate nature of this fieldwork, which took place within the consultation room of a women's health physiotherapist, no audio or video were recorded. Photographic images were recorded of medical devices and white board outside the room, the waiting area, only. In 4.4.2, data collected as part of the deployment of the design toolkit included audio-recordings of the design workshops, and photographic images taken during the workshops. Initially, I had

planned to use a pre- and post-questionnaire to gain pre-assessment to levels of participants' body knowledge. I designed a pictorial questionnaire as a prompt to locate the pelvic floor muscle structure within a female body outline illustration. Participants were to complete this, using a small coloured sticky dot label, prior to the beginning of the workshop. As a conclusion, to gain assessment of learning outcomes, a similar pictorial questionnaire was handed in the end, together with a short dichotomous survey and a set of open-ended questions (Appendix 6. An eTextiles Toolkit). Moreover, and due to the nature of the project and ethics process approval by the University, I had formalized a written explanation of what the pelvic floor in women is and what the pelvic muscles do, and I also explained it verbally while recruiting for the workshops. This enactment prior to the workshops deemed necessary based on the sensitive nature of the topic and the seeking of engagement and consent would make this quantitative data inadequate, as it resulted of the explanation about the project I had given while recruiting, other than previous knowledge by the participants.

In 4.4.3, data are collected following the deployment with Labella and included audio-recorded semi-structured interviews with the participants (the woman/couple) at separate times. The material kit delivered to each participant included a customized piece of underwear in their size, simple instructions, an information sheet about the project, and a mobile phone with the app installed (four participants in the women only study provided their own phone). An average of one week had been agreed on for participants to keep the materials kit, a time schedule that ended up varying in duration, ranging from two days to two weeks, mainly due to their availability. The material kit was accompanied by an audio device to record thoughts post-experiment, and three note tags for writing. Experiencing the probe required embodied interaction, which was carefully designed to enable the woman (and/or partner) in (self-) knowledge, while accounting for aspects of ambiguity in the design. In addition to the interaction, there were two different instances within the design of the technology in which 1) an audio snippet (10 seconds) was captured – during the first few seconds of interaction on the body, triggered by recognition of the marker on the piece of underwear, 2) taking a photographic image was requested. In both instances, the participant was given the option to fulfill or cancel the request and not send any to the researcher. I had initially planned to use a pre- and post-questionnaire as part of this study however, and in agreement with the experience described for the questionnaires in Chapter 6, this too deemed irrelevant for this final study, as the final quantitative data was inadequate if considering the written and oral explanation regarding the project while recruiting individually.

4.4.1 *Empathic Inquiry*

In order to encapsulate the first-hand experience of fieldwork within a clinic, as I describe in Chapter 5, I created a narrative from the perspective of the observer in order to gain understandings of the experiential qualities of care and the capacities of digital interaction as medium to support women's (user) experience. All quotes are paraphrased from participant observation, and drawn from informal and spontaneous interviews with the physiotherapist, who in the thesis I will name Charlotte (a pseudonym).

As aforementioned, these ethnographic observations were conducted at the Women's Health and Therapy Services, Physiotherapy unit at the local hospital, under the supervision of Charlotte. The hospital has been providing healthcare to communities in the North East of England for over 250 years. The Women's Health Unit (WH) is an outpatient unit, and during the study, the WH department was understaffed, having the equivalent to two and half fulltime staff working in Therapy Services, Physiotherapy. Scheduling my appointments as an observer was pending on Charlotte's interchanging schedule, and that of medical students she orientated (attending to her consultation). Charlotte works part-time (three days a week), and consults across units (gynea, maternity, physio). There are two consultation rooms for WH physiotherapy, and this is also where Urology consultations take place, as a wall sign indicates most recently. There have been more male patients coming through for treatment lately, according to Charlotte, and I did assist to one such appointment.

There might have been a number of limitations to this study. Firstly, the study comprises observations of 31 patients who attended consultations for varied pelvic disorders by a single physiotherapist. Secondly, the complexities of their symptoms were handwritten only, as observed with the consultation, with no interviews follow-up. Nonetheless, my sample was representative and diverse for a qualitative cohort, and provided in-depth insights into a diversity of disruptions to the female body that demand for professional women's health care. Throughout these sessions, values such as communicative competence, imaginative empathy, and reflective self-awareness (Bardzell & Bardzell 2015) highlighted, in my view, a demand to develop a humanistic approach to systems design that can positively re-script:

a) notions of bodily awareness in health and integrity
b) the qualities of the interactions, not only between patient and the therapist but also with and within the medical devices in use[3]
c) the redesign of intimate care tools and devices to include gender technology relationships as fluid and situated (Wajcman 2010).

4.4.2 *Design Workshops and Activities*

The deployment of the eTextiles toolkit occurred within four design workshops. First, with a group of six teenagers aged 15-16 in a secondary school; second, with a group of seven women in an international women's centre; third and fourth, in situ at location of research lab at the time, with a group of five and four women aged 20s-30s and 40s-50s respectively. These design workshops were a field site to work in, and learn collaboratively in, an inter- and trans-disciplinary way, inasmuch as a research instrument within which I envisioned material engagements as opportunities for learning (Rosner et al. 2016), with an emphasis on the shared act of making rather then the final object (Ratto 2011). The activities with and around this toolkit included 1) body mapping and 2) DIY wearable eTextiles.

1) Body mapping

Body mapping gained momentum as an art-therapy method for women living with HIV/AIDS in South Africa (Wienand 2006, Solomon 2007) and evolved as a research methodology, nowadays employed both as therapy and research tool. Traditionally, the technique of body mapping implies outlining the shape of the human body as a starting point, a life-size picture of oneself transferred onto paper or canvas. It is an experience that invites people to "express mental maps of the human body in a visual way" (Shahaduzzaman & Chowdhury 1998) and includes, among others, using drawing, painting, or talking in groups to reflect on what is happening (Solomon 2007). This creative visual method has been applied in varied areas of health and social care, including mental health (Immadisetty 2012); public health and education on HIV/AIDS (Wienand 2006, Devine 2008); sexual health and women's perceptions of reproduction (Shahaduzzaman & Chowdhury 1998) and menstruation (Zablotny 2014). Topics of migration, e.g. a case on undocumented workers in Canada which employed body maps for telling their stories (Gastaldo et al. 2012), or conflict resolution in which body maps were used as an educational tool to facilitate the teaching of life skills amongst youth (Reddy et al. 2009) are further examples of research that apply this method to

[3] A collection of current medical devices was gathered by me and used in a set of speculative design oriented workshops. While data was collected during this set of workshops, it will not be discussed in depth within this thesis. For more information on this: http://www.banhomaria.net/intimatecare/pelvics/index.html

explore identity, social relationships, and develop insights and awareness about the world around us.

As a creative methodology, body mapping "offers a positive challenge to the taken-for-granted idea that you can explore the social world by just asking people questions, in language" (Gauntlett & Holzwarth 2006). Moreover, participants in a research as such generate visual data and the method helps stimulate dialogue and share knowledge.

Initial concerns were the taboo associated with this body space. In adopting this method I refashioned the traditional concept of body mapping by adapting it into a specific area of the body, the female pelvis, which was framed by a pair of knickers. Within them, one would have a bound blank space where to draw the overlapping internal organs, such as the reproductive and pelvic organs, just as the external genitalia. The intention was to use this creative method to prompt awareness of the body and it being an icebreaker to talking about areas of taboo that are problematized by touch (Suvilehto et al. 2015) and are a private and 'risqué subject matter' (Braun 1999). In their recent study, Suvilehto et al. discuss social touch and the human body (Suvilehto et al. 2015), showing the sex organs to be the utmost taboo zone among both male and female participants to be touched by others. Moreover, the difficulty associated with researching 'troublesome' topics and the "social codes that dictate that we do not talk about our 'private parts' with strangers or acquaintances" as it were a transgression of boundaries between public and private is explored in (Braun 1999). In this sense, body mapping was positioned as an alternative approach that employs clothing as embodied experience to express knowledge of the body and facilitate conversations around these private parts.

2) DIY Wearable eTextile

In engaging with clothing as embodied experience, I wanted to centre the focus on the anatomy of the pelvis and perineum. Following the body mapping activity this focus would shift to include the morphology of the pelvic floor, which was the critical topic area in health education that the toolkit focus is on. I wanted to investigate the possibilities for technology to support knowledge of this bodily topic area, in particular to explore do-it-yourself (DIY) wearable e-textiles as an interaction material for health and wellbeing, and method to engage (young) women in care of the self.

As discussed in Chapter 2, computational textiles have been explored in HCI research as a medium to introduce technology in schools and to different groups of students or participants

(Kafai et al. 2013, Kuznetsov et al. 2011, Qiu et al. 2013), and to relate computing to everyday life (Katterfeldt et al. 2009). Within this educational context, they are mostly explored and keep on being developed to support technology education, engagement, aesthetics, and diversity in computer science and engineering education. Thus far, eTextiles have been found to be highly engaging to women and girls as a means to learn about electronics; technology (Buechley & Perner-Wilson 2012, Weibert et al. 2014).

In engaging with and making e-textiles, this toolkit was envisioned as a way of encouraging (young) women to learn about their intimate bodies, while experiencing computational textiles as an interactive material to learn with and critical making as method to bridge the gap between traditional education and learning on the body.

The intention of this toolkit was not to teach e-textiles, rather the toolkit use was developed to spark the curiosity of (young) women on preventative self-care practices, such as pelvic exercises, by making and being engaged with creative technologies. I positioned the toolkit as a tangible set of resources to enable conversations around intimate care within HCI. Similarly to BodyVis (Norooz et al. 2015), a research that innovated methods and promoted body literacy among children and within a school environment, I explored wearable electronic textiles as a new approach to teaching and learning about anatomy and physiology. The prototype in BodyVis aimed to make tangible unseen parts of the body and employed computational textiles to deliver such an interactive experience of "body organs". At the same time, it explored engagement and learning with technology to stimulate knowledge of organs that "are invisible and untouchable". I expanded this work by making tangible unseen but also intimate parts of the body, those that are primarily problematized by touch and visibility. In the case of this toolkit, it does so by emphasizing learning of the body through making, and exploring the material landscape of electronic textiles.

4.4.3 *Individual Deployments and probing technology*

Similarly to the design workshops detailed in Chapter 6, I designed and developed a tangible, individual materials kit to be delivered to and used by women participants, and which I named Labella. Labella traverses through on-body and mobile mediums, as I turned to embodied intimate interaction that involves the body and a mobile phone to explore possibilities for promoting knowledge in self-care and care of other. In Labella, I use augmented reality (AR), a technology used to supplement reality, rather than completely replacing it (Azuma 1997), as a tool to help reveal the body to the self in an intimate way. This exploration is prompted by

wearable and mobile technology, and by providing a humorously magnification of an utmost intimate part of the body. I inquire how the use of this digital technology – one that traverses embodiment and humour - can make accessible a reality laden with stigma and taboo and support embodied interaction, intended to promote self-awareness and engagement in preventative intimate care health practices.

Recent work in wearable e-textiles has begun to explore the impact of on-body technologies in learning (Norooz & Froehlich 2013, Norooz et al. 2015). Further work has investigated interactions within clothing that interface with mobile technology (Profita et al. 2013). In addition mobile interfaces for women's health and wellbeing have investigated the design of technologies with a focus on intimate care work in relation to hidden parts of the body (Balaam et al. 2015) and involved in sexual functioning (J. Bardzell & Bardzell 2011b). This work situates itself in this previous research by exploring how body-worn and digital interactions might support health and education in relation to intimate parts of the self.

For the purpose of this research and deployment, I situate Labella as a technology probe. Conceptually, "technology probes are a particular type of probe that combine the social science goal of collecting information about the use and the users of the technology in a real-world setting, the engineering goal of field-testing the technology, and the design goal of inspiring users and designers to think of new kinds of technology to support their needs and desires (Hutchinson et al. 2003)". Labella draws from the open-endedness afforded by the design qualities of such a probe, and making the most of its field-testing. Moreover, I argue that methods that emphasize situated practices through employing wearable and mobile technologies can support women's bodily experiences in relation to the reproductive system, continence and sexual pleasure (Chiaro 2015, Minna 2014) by promoting literacy to enable self-care.

4.5 Data Analysis

This section describes the qualitative methods chosen for each one of the three studies, which include and document 1) *observations:* The data corpus consisted of handwritten fieldnotes of physiotherapy sessions, informal and spontaneous interviews with the physiotherapist, leaflets from the NHS, and photographic images of medical devices. This data were analysed using a thematic analysis approach (Braun & Clarke 2006), and experiences of women's health, in relation to both the patient and the therapist, were noted. 2) *Design Workshops and Activities*: The data corpus consisted of audio recording of all the workshops, which I

transcribed, and all quotes used in the chapter are verbatim from transcription (Sample in Appendix 6. An eTextiles Toolkit). I also draw from an informal interview with the teacher, Jackie, which was audio recorded and from which I kept hand written notes. In recruiting for such a participatory workshop, one in which women (and girls) come together to discuss experiences and learn about their intimate bodies, a relationship based on mutual care needed to be established between them and myself. While quantifying data may have been an approach to design a possible data source, the aforementioned pre- and post-questionnaire, it did not enable these women's knowledge or was true to their experiences. Analysis of this data consisted of using a thematic analysis approach (Braun & Clarke 2006), which I later used to inform the design artefact described in Chapter 7. (See Appendix Chapter 7 for further detail). 3) *Individual Deployments:* For the purpose of data analysis, audio was transcribed and hand written notes were compiled in one document. Although some audio was collected (of/during experience with Labella), it ended up not being accounted for in the analysis as it deemed irrelevant for the purpose it had been anticipated for: capturing aurally the moment the woman sees the augmented illustration on the mobile screen, during the on-body interaction. Some photos were collected and served a purpose during the post-interviews only, i.e. visual imagery wasn't analysed per se, only the context. Analysis of this data consisted of using a thematic analysis approach (Braun & Clarke 2006). (See Appendix Chapter 7 for further detail). Initially, the materials kit had also included an audio device to record thoughts post-experiment, and three note tags to write thoughts. These were delivered within the women's only study, having had as little as three women returning them in the end (one of which with nothing written on and without audio recording). In evidence of such limited response, I decided not to include the audio device and note tags in the succeeding couple's study. I also did not use the data collected in this manner, as topics on note tags and audio device were covered during the semi-structured interviews.

4.6 Summary: Woman-Centered Approach in Practice

In this Chapter, I described the processes took forward in order to advance the woman-centered approach. This thesis comprises thee distinct epistemological studies and, as such, different procedures were required to fulfil ethical approval, recruitment of participants, and methods of engagement with the research and the subject (in) matter. I outline the steps taken to obtain the necessary ethics and selection of participants for each of the three epistemological studies, and give an overview of the creative methods employed in the design of workshops, activities, and devices.

The next Chapter introduces the first of three epistemological studies, and inquiries how HCI as a field can transform women's care practices. Specifically, I consider qualities of intimate care to explore the possibilities of a woman-centered methodological approach to designing technology-enabled interactions in professional and personal settings.

Chapter 5. Intimate Care Work

5.1 Introduction

In this Chapter, I start by providing a conceptual overview of urinary incontinence in women. I carry on to recount fieldwork on women's experiences with urinary incontinence achieved through an observational study undertaken within a women's health clinic consultation. I use this as a case study to discuss how HCI as a field can transform women's care practices.

5.2 Urinary Incontinence in Women

Urinary incontinence (UI) is generally defined as the involuntary loss of urine (van den Heuvel et al. 2012). Although both men and women can experience incontinence women are twice as likely to experience incontinence across the lifecourse. Recent contributions to medical literature report that approximately one out of five women suffers from moderate to severe urinary incontinence (Matthews 2014) or that it varies in a range of 12% to 55% (Castro et al. 2015). In women, incontinence "is neither an illness nor, strictly, a medical problem, descriptively labelled a bodily dysfunction rather than a diagnosis, a social rather than a biological pathology" (Peake et al. 1999). For example, incontinence is generally accepted as a consequence of childbirth and/or aging. It is regarded as "normal", similarly to menstruation once a month and menopause once in every lifetime (Martin 1997).

Caring for the disruption and dysfunction of UI can affect a woman deeply. Not only because it may be a bodily function that is difficult to control, which on one hand affects the social person and on the other that person's intimate relationships, it is also a mark on a life trajectory. As coping mechanisms, people abandon their outdoor habits and routines and change the clothes they wear to disguise episodes of incontinence, and women choose to constantly use sanitary towels as a method of achieving social continence (preserving independence and quality of life while managing incontinence) (Roe & May 1999). Nonetheless, these techniques used to manage incontinence can prevent the establishment of relationships or cause embarrassment (Roe & May 1999). As a result, incontinence constitutes a threat to everyday activities that requires mechanical means of protection and body maintenance, which can have an impact on social membership (Peake et al. 1999) and affect lifestyle. Since the body is a medium of culture (Lupton 1994) incontinence can impact on the sense of self. Nonetheless, the association of UI with childbirth and menopause, together with experts' opinions, reinforces a cultural model of UI as a normal aspect of womanly inheritance. Through normalization comes acceptance of commodities such as pads, which

are easily available as "normal women's apparel" (Peake & Manderson 2008a). They are assimilated as part of a lifestyle, and therefore of a body in control.

Generally, women are reliant on the institution to choose medical devices for them (Rossmann 2008). Likewise, women must rely on a medical practitioner who can diagnose their UI to receive appropriate treatment. Diagnosing UI in women is complex, invasive and at times embarrassing. Quantifying incontinence requires women to undergo invasive procedures, such as urodynamic analysis (which requires the insertion of a catheter), within a clinical setting and rely on the results to determine whether it is "simply a bit of dribble" (Peake & Manderson 2008a) or a condition that requires surgical intervention.

5.3 Women's Health Physiotherapy

5.3.1 *Tiers of Care: Women's Journeys to Therapy Services*

In the UK, the health service is divided into two tiers: primary and secondary care. Primary care refers to the care a person might receive from her general practitioner (GP) or, for example, community physiotherapists. It traditionally refers to community based care, and tends to include, among others, preventative care (e.g. health screening, health promotion), help to self-care, or maintenance of long-term health (e.g. day to day management of stable chronic conditions). Secondary care refers to the care a patient receives in hospital, as either an in-patient or an outpatient. It involves utilizing specialist knowledge or skills, or providing more intensive care than can be provided in the community (NHS n.d.). The National Institute for Health and Care Excellence (NICE) sets out the quality of care and support for urinary incontinence in women (NICE 2015). This quality standard for urinary incontinence in women states that: the woman starts her journey by first going to her doctor for an examination and incontinence history, which will help *"identify the type of problem and decide whether referral to a specialist is needed"*. To help identify the problem, the woman is asked to fill in a bladder diary for a period of 3 days and she is advised on possible lifestyle changes that might support improving symptoms; the woman might be offered products, such as pads, that will temporarily help her manage her social continence; if referred to a specialist, she is assessed by the physiotherapist and offered 3 months of training in pelvic floor exercises as a first treatment; alternatively, she can be offered bladder training. Ultimately, in light of the treatments mentioned being unsuccessful, the woman is offered surgery or other invasive treatment.

As noted above, urinary incontinence is an example of how a disruption to the biography of the body evokes the need for intimate care. With urinary incontinence in women as my starting point, I undertook an observational study within a clinic to understand the components of intimate care within a women's health professional setting.

Therapies

Most of the time women arrive to the women's health physiotherapy consultation with Charlotte after a referral from primary care, which includes a preliminary assessment by their GP. Only a few are referred from a community centre nurse.

Before attending to patients, Charlotte looks at the list of appointments she has got for the day and briefly assesses the variety of treatments she expects to deliver throughout the day. Every day is different, and patients may be coming in for the first-time or for a follow-up consultation, with treatment for health conditions ranging from carpal tunnel in pregnancy or ultrasound therapy in post-natal women. Clinical consultations in women's health physiotherapy are divided in three main categories: ante-natal, post-natal, and gynaecological, and the most common symptoms that lead women to seek treatment are stress, urge, and mix incontinence across the three. Other symptoms include carpal tunnel, back, and pelvic pain, most frequent in ante-natal consultations, and prolapse, which is primarily a condition diagnosed in post-natal women.

During the study, I attended nine gynaecological consultations, nine ante-natal consultations, and thirteen post-natal consultations. Each of these consultations involved an examination by the attending physiotherapist. 17 included an initial assessment (first-time patients), four for a follow-up on stress, urge, or mix incontinence, six with severe back and pelvic pain, and four for ultrasound treatment for perennial tear. The one male patient was a follow-up consultation related to persistent incontinence symptoms.

In the following section, I describe my findings by identifying patterns of intimate care work within a women's health setting.

5.4 Perceptions and Experiences

In this section, I discuss insights from my observations and informal conversations with the therapist regarding interpersonal relations, the therapies, and technologies in use for this practice. I start by describing a consultation, representative of the intimate care work

performed by the physiotherapist, and continue to explore perceptions and experiences of patients-physiotherapist regarding the act of intimate care on the body required by the advent of incontinence.

5.4.1 *Within a Consultation*

Charlotte starts by welcoming the patient into the consultation room. She sits on her chair and looks back at the patient's information, which she has on her desk. She then starts a conversation with the patient, who is now also sitting and facing Charlotte, and this initial conversation will help her cross-examine the patient's clinical history, when this is a first-time patient, and to ask further questions concerning the patient's present-day symptoms, whether a first-time or a follow-up consultation. While doing this, Charlotte handwrites her own notes in a departmental designated paper-based form and, based on the patient's clinical history and account of symptoms, she decides on the examination that will help her make a clinical informed assessment. Typically this includes a manual exam, which Charlotte performs on patients with symptoms of stress, urge, and mix incontinence. This clinical evaluation of the pelvic floor relies on manual muscle testing with vaginal palpation, which comprises a manual and internal examination of the vagina for muscle strength and tone, allows her to understand whether the patient is able to contract her pelvic floor muscles and by how much. Technically, in women, a contraction of the pelvic floor muscles is based on the modified Oxford Grading System, a grading system to measure pelvic floor muscle (PFM) strength ranging from zero to five, in which zero represents weak with 'no contraction' and five amounts to 'strong' (Bø & Sherburn 2005). By performing this exam, Charlotte is able to effectively generate an initial evaluation of weakness or strength, as is able to adjust a continuation of treatment based on improvement. The prescription varies and depends on each patient, since the prescription takes into account a women's personal biography, for example, whether the woman is making plans for a future pregnancy, or the biography of her body and any disruptions that might be present, such as a prolapse. Nonetheless, pelvic floor muscle training (PFMT) is the conservative line of treatment prioritized, and unless proven ineffective or contraindicated, pelvic floor muscle exercises (PFME) are generally prescribed to most patients.

5.4.2 *Crossroads of Women's Health Work*

What brings these patients to Charlotte is ultimately a point of crisis. The difficulties in managing their own continence have intensified to a point where self-care is no longer viable. Here I describe three interactions within Charlotte's consultation room. I document the

experiences of Ellen, Kate, and Hillary (pseudonyms) while seeking therapeutic support for their 'bodily dysfunctions'.

Managing the Leaky Body

Ellen walks in to her first appointment accompanied by her husband. She is seventy-one years old, has had four children, later in 2011, she had her uterus surgically removed. Referring to clinical procedures that involved invasive repair, she comments:

"They (medics) don't explain what they're doing, they just shut it up your body." (Ellen, 71)

She has been managing incontinence by keeping urine charts and wearing incontinence pads. She had also been told to do pelvic floor muscle exercises long after childbirth but has felt worst after doing them. In fact, she acknowledges that she had never understood how to do them, and had never been explained how to either. This time, Charlotte does not perform a manual exam to assess. Instead, she shows her a cross-section model of the female pelvis and describes exactly where the pelvic floor is, explains what it does, and how to exercise the muscles:

"Imagine the vagina is like a tube; start squeezing from the back passage to the front passage; do not hold your breath; squeeze, hold, count up to ten, five seconds, relax. Do it three or four times a day."

At the moment, Charlotte's work involves teaching and the intention is for Ellen to learn how to get her pelvic floor to work better. This care work is passed on to her, and it will require her to take control and continue exercising.

Contrary to Ellen, Kate is certain that she knows how to do PFME, and she has managed to include the exercises in her daily routine, mainly "while driving". She is 50 years old and she has had six children, the last of which was born when she was 48 years old. She is professionally active and her job requires her to do some lifting which, as a result, is aggravating her pelvic health. She feels "uncomfortable" (prolapse: her uterus is low onto her vagina) and she has symptoms of stress incontinence. During the conversation, and after looking at Kate's clinical history, Charlotte informs her that she has had three different areas of prolapse, likely heightened by her later in life pregnancy. But Kate is not aware of the particulars that caused a disruption to her body. Similarly to Ellen, her comment is that "*they*

don't tell us anything". Charlotte chooses to perform the manual exam on Kate. She suggests doing so while pointing out that such examination is the necessary course of action for her to finally determine what is wrong and what to do about it. Kate seems agreeable, does not ask any questions about the procedure, and promptly stands up. The examination entails Kate moving to the other end of the consultation room. The room is divided by a wheeled screen, behind which she removes her clothes, after which she lays down on the examination table, facing up. Without hesitation or further explanation, Kate does so and is promptly ready. Charlotte finishes her notes at her desk and once knowing Kate is ready (through conversing across the dividing screen) she too proceeds to the other end of the room and prepares for performing the exam (she sits in a low rise stool and puts on surgical gloves). Kate takes a comfortable position, legs flexed apart knees bent, and Charlotte explains her the procedure while beginning the internal examination (manual vaginal palpation, for which she uses one finger to evaluate pressure, duration, muscle structure, displacement), the technique currently used by most physiotherapists to determine qualitatively whether or not there is a muscle contraction (Bø & Sherburn 2005). This involves Kate contracting her PFM as hard as possible, to sustain a contraction, or to contract and release instantly and repeatedly, as requested by Charlotte, who at the same time evaluates and quantifies strength while giving Kate feedback on her seemingly ability to perform well. Kate does manage to exercise accordingly and, after repeating the exercises a few times, this is enough for Charlotte to realize that Kate has a good pelvic floor muscle, which is what "*is keeping everything inside"*. Initially, Charlotte starts by recommending the practices of Yoga or Pilates as way of promoting regular exercise to help maintain good pelvic health, but ends up recommending her to surgery, the final course of action in the line of treatments available, which will fix the body internally so it stops leaking. It transpires that this is what Kate *"was hoping for*", Charlotte comments after Kate has left the consultation. Nonetheless, this bodywork (surgery) requires invasive procedures that some women would prefer to avoid. One example is that of Hillary, she has a third degree prolapse, which is making her bladder 'come forward' and descend out of her vagina. She hasn't been suggested surgery yet and Charlotte hopes to understand, by performing the manual exam and assessing her pelvic muscle strength, if PFME could help. Like Kate, Hillary's job is demanding of her body posture, requiring her to be standing all the time. While the pelvic floor *"works against gravity, and it is working all the time"*, Charlotte informs her, Hillary's pelvic floor muscles are very weak which is causing the prolapse to *"bulge out"*. Hillary questions:

"Is it a problem with people this age?" (Hillary, 51)

Moreover, information regarding preventative health care practices, such as pelvic exercises, is normally unheard of before critical symptoms lead women to seek therapeutic assistance from a professional body. Hillary comments:

"I'm thinking, I'm going to be 52 and never done anything, now I have all these appointments!" (Hillary, 51)

The absence of knowledge regarding their bodies and the path that led them to arrive in Charlotte's consultation is apparent mostly throughout. Moreover, Charlotte considers that *"some women have very little awareness of their bodies"*.

Taboo of Bodywork

Little awareness of the intimate body and the bodywork associated with it is a barrier for intimate care, for example, the fact that it often involves parts of the body that are hidden, involved in sexual functioning or human waste contribute to physical and cultural taboos associated with it.

By way of example, I describe the bodywork received by post-natal women who were prescribed with perennial ultrasound as a line of treatment. A perennial tear is common during childbirth, and it can heal naturally or, if more extensive, require surgery. A perennial ultrasound is provided for post-natal woman who have had a significant perennial trauma. Treatment involves a two minutes pelvic massage to soften scars with ultrasound, over the course of ten to twelve sessions to be effective, and it usually takes up to three sessions for any improvements to start showing on the soft tissue. The procedure, much like that of the manual exam, is straightforward: Charlotte covers the examination table with paper and makes sure everything else is in place before the woman enters the consultation; once the woman comes in to the room, they converse; the woman removes her clothing behind the screen that divides the room: desk with computer and chairs on one side, table for treatment on the other; Charlotte finalizes her notes at the desk; the woman is laying down on the examination table, and uses a towel to cover her pelvis; Charlotte redirects the light fixture hanging from the ceiling to shine on this woman's perineum, she puts on gloves, covers the ultrasound device with a condom and adds some gel to it: this is the surface which will be in direct contact with the skin of the woman.

During my observations, a total of four women had follow-up appointments for an ultrasound. Being a continuation of a treatment already started, all four women were already acquainted with Charlotte, just as Charlotte was with them. The sessions did not present any difficulties, for example, in one appointment the patient and physiotherapist's talk was amicable and lively throughout the treatment. Generally, it was Charlotte who drove the conversation. Moreover, she minimized the awkwardness of this setting by stressing therapeutic facts, such as that the perineal injury is visibly improving or that the scar might feel more sensitive due to the menstrual cycle, all acceptable informed knowledge that helped normalizing the experience.

5.4.3 *Women's Expectations*

After an examination Charlotte discusses a treatment plan with the patient. The most commonly prescribed line of treatment for women with symptoms of incontinence is pelvic floor muscle training (PFMT), which aims to improve pelvic organ support (e.g. bladder) and increase control over pressure on the pelvic floor. The prescription is typically based on an amount of exercising a day, which, once assigned to the woman, she will need to assume responsibility for and be proactive about, by doing it at her own time, and by incorporating it into her daily life.

Finding the time to do the exercise or remembering to do it are major concerns identified by some of the women. *"Life gets in the way"*, Ava (pseudonym) comments. She sits in the consultation room for her follow-up with Charlotte. She has a long history of incontinence and her last examination had been six weeks earlier. Her treatment includes pelvic floor muscle exercise three times a day, which she forgets, she has *"too much to do"*. Charlotte recommends the use of visual reminders, such as putting a chart on the wall or on the fridge. PFME is also more difficult to fit in (the daily live) then doing it. Charlotte remarks:

"If doing it right, no one should notice that you are doing it." (Charlotte)

PFME can be incorporated into a daily routine, for example, *"while driving"*, or *"while brushing your teeth"*. Understanding the technique is key, and once it is incorporated PFME can be done anytime and anywhere. The intimacy of this practice involves its invisibility to others, making it self-empowering as the woman is confident to be doing it correctly, hence working toward her personal health.

As noted before, recommendation for surgery is seen as the final solution for incontinence. Charlotte sees a great number of women who go through a series of regular appointments that include GP, gynaecology, and physiotherapy, until they are 'approved' for surgery and give their problem a final solution. In contrast, in the case of Hillary, who I have discussed earlier, she is not yet ready for a surgical solution. She has a third degree prolapse and just started looking for the adequate treatment. She asks about pessaries, which are medical devices used internally to provide structural support (or as a method of delivering medication), as an alternative to surgery. Charlotte informs her that they are not usually considered an option or generally recommended within the NHS, they are more commonly used in the US and Canada. She also comments on the fact that some people can't retain them, and they just keep dropping. *"It's usually difficult to find a shape that adapts to the women's body, it's a lot of trial and error"*. Besides, *"women don't generally know their bodies in ways that help them fit the pessary easily"*, referring to the possibility of having the woman inserting and removing her own device whenever needed instead of having it done more permanently in clinic.

Figure 9: Female pelvis: section anatomy model used within the consultation

5.4.4 *From Charlotte's Standpoint*

While Charlotte performs mostly a manual exam on her patients, there are a variety of medical devices and tools that can also be used within her practice, such as the ultrasound mentioned earlier. Commonly used items include a variety of specula, probes for biofeedback (to assess whether the patient is able to perform a correct pelvic floor muscle contraction) or

electric stimulation (to gain a better understanding of existing muscle movement), dilators (for cases of overactive pelvic floor), and vaginal cones (to assist in PFME).

Charlotte shows me some of these devices that she keeps in a medical supply cabinet. She describes the *Sims speculum*, which is the medical device usually used to check prolapse. This is not a device that she uses very often in her daily practice however she is trained to use it in case of need. The device makes her feel *"uneasy"*, due to the required technique of use: the woman patient needs to be lying down and sideways, and the physiotherapist needs to insert the speculum while standing behind her. Much like the vaginal speculum, which gets its job done, it is designed to be ergonomic for the people using it rather than the people receiving it. Charlotte remarks that it is a *"very dominant position"* (she finds herself in while performing the examination). It *"feels like I can do whatever"* as the patient is *"very submissive"*. The fact that there is no visual contact and that she can't look at the face of the patient also works as an obstacle to engage in a conversation. Furthermore, she is in the opinion that these instruments, available for therapeutic evaluation, are *"in much need of redesign"*, as she admits that discomfort, a sense of vulnerability and a sense of undesired control (or lack thereof) during such examinations occurs from both ways of using the speculum. According to Charlotte, more than 50% women who have had a delivery have a small prolapse, but this does not affect their daily life. Moreover, women want "*to be perfect"* after delivering, she comments. But there is "*no magic cure"*. Nonetheless, some women describe symptoms such as a constant feeling of wanting to *"go home and get changed"*, an urge to *"go to the loo"*, or that it *"feels like something is going to fall out"*. These are understood as serious enough symptoms since they affect daily routines and quality of life in general.

Moreover, the care work involved in improving such symptoms include bodywork that needs teaching and learning from both cared-for and person giving care, as each biography is unique in its disruption. Overall, the pelvic floor muscle is *"an anticipatory muscle and it can be a lazy muscle"*. When *"trained"* it *"works automatically"*. Thus, it is bodywork that entails a lifetime of fitness. Whereas within a consultation Charlotte assesses and examines the biography and the body to understand the disruption, the patient relies on Charlotte's judgment and expertise to help with her symptoms. The prescription varies from patient to patient, as do results based on patient's compliance with the treatment. There is no *"magic wand"*, she remarks. It is the patient's responsibility to follow through with her prescription, which she cannot oversee (unless and until there is a follow up appointment) but only recommend.

5.5 Women's Health, Intimate Care, and HCI

In my case study of women's urinary incontinence I introduced a life disruption centered on the body and presented findings from my observational work, which was conducted within a women's health physiotherapy consultation room. My findings highlighted that bodily interventions in women's health, whether on the self or the other, involves body literacy, concern, confidence and mutual trust. In this section, I expand on the role that HCI can contribute to improve women's health and opportunities for digital technology to improve women's experiences and practices around women's health.

5.5.1 *Women's Health as Life Disruption*

Despite the apparent continuity of the body as a site for the self, the body has also been understood as a site in flux. As argued by (Shildrick 1997), the body is a fabrication, it is "organised not according to an historically progressive discovery of the real, but as an always insecure and inconsistent artefact, which merely mimics material fixity". Marked by a deviant state, such as being ill or unhealthy, it is then characterized by a lack of bodily control, a way through which the body can reflect its biography. Disruptions to the biography of the body can occur at any time and they are made visible in different ways. While symptoms might be similar, treatments might vary depending on personal life story, for example, if involving family planning (decisive when and if considering surgery). Some other examples of disruptions to the body are that of loss of a breast or a limb, which affect "not simply corporeal integrity, but also the sense of who we are" (Shildrick 1997). Both have a massive impact on one's self-esteem, body image, and intimate relationships (Mathias & Harcourt 2013, Schover 1991). I recall the patient who feels that something could 'fall out' off her body at any given time, and how that potentially impacts her daily routines, creates anxiety, and makes her move about differently. Furthermore, the magic wand Charlotte refers to is nothing but a desire expressed to make perfect something that is primarily invisible to others, but yet can be vexatious to the self and in intimacy with others. Other disruptions and dysfunctions to the body, like infertility and menopause, raise questions about gender, and provoke social embarrassment (Martin 1997). Dysfunctions related to the aging body revolve around bodily difficulties such as mobility and continence, and bodily esteem may disappear at an older age (Twigg 2004).

5.5.2 *On Knowing*

As one sees when Charlotte explains the subtle technique of exercising the pelvic floor to Ellen she is sharing and transferring knowledge of the body that in turn extends Ellen's own

understandings deeply. So much so, that something Ellen had never perceived before throughout her lifecourse was now made tangible by Charlotte's descriptions on a visual model of the pelvis. In my experiences on the ward, I see a number of appointments such as this, and through this how body literacy is paramount to support timely preventive care practices on the body i.e. having knowledge of and knowing how to care for one's own intimate anatomy can potentially safeguard future health. Taboo, misinformation, and lack of self-awareness of our personal bodies can be a hindrance to provide self-care as much as care for the other. Moreover, the lack of information or misconceptions about the disruptions happening on their own intimate bodies is recurrent among the majority of Charlotte's consultations.

One outcome of these appointments for each patient is an opportunity to learn more about their own bodies, their intimate anatomy. Yet, it is striking that it appears to take the life disruption of urinary incontinence, and quite often the intimate care of another woman, for a woman to establish some form of body literacy. And, although through this act of care the women do learn something about their body, this learning is second hand. There is little visibility of the knowledge gained by Charlotte through her examination, or attempts to pass details that would enable a woman to examine her own body to detect and track increasing strength in her own pelvic floor muscles. A system such as the transperineal 4D ultrasound might serve to assess PFM damage (Morin PT et al. 2014) and provide visual feedback on screen of what a therapist sees and does during an examination. Yet the therapeutic ultrasound for post-partum perineal tear within this clinic does not have a display. Systems such as AnatOnMe (Ni et al. 2011), a medical handheld projection device have made use of augmented reality to project onto the patient's body a variety of bone fractures. Expert interviews in relation to AnatOnMe suggested that such AR projects would help a physiotherapist teach parts of the anatomy relevant to the injury, the bio-mechanics of the affected area, as well as the signs and symptoms of the injury, rationale of treatment, and physical therapy goals. I wonder what would it be like for a woman during an internal examination to view on her body a 'reality' of what the therapist is feeling and experiencing. A system such as this, designed to enable a woman to view the anatomy and biomechanics of their vagina and pelvic floor muscles during an examination may well similarly create opportunities for more effective and engaging conversations about a women's intimate anatomy that supports and fosters better body literacy and (self) caring practices.

There were no explicit displays of emotion during the consultations I observed, and since I was not able to interview women directly about how they were feeling before or after their consultations I cannot categorically say how these women were feeling during their examinations. However, qualitative research on women's experiences of smear tests and internal examinations would suggest many were feeling anxious, embarrassed and uncomfortable (McKie 1996). Given these negative emotional experiences, I might question whether additional learning during a consultation would be the most effective way to help women develop literacy about their own body. This brings us to consider whether there is potential in the creation of artefacts through the examination procedures that might enable learning and literacy afterward. A small body of work has explored the creation of souvenirs to mark 'rites of passage', such as riding a terrifying rollercoaster (Durrant et al. 2011), through to 'sonic souvenirs' (Dib et al. 2010) of family holidays. There is an opportunity for HCI to similarly explore the extent to which 'souvenirs' of intimate women's health examinations and check-ups might be created. On the face of it, this may be a strange souvenir to possess. However, creating and providing these souvenirs could enable a woman to explore her own body, at her own pace in ways which don't provoke shame, taboo or discomfort. And, through so doing empower a woman to come to know her body in ways which support prevention, maintenance and remediation.

Each of these provocations suggests ways in which examinations might be augmented to enable increased body literacy among women during routine or responsive appointments. However, what these approaches do not do is tackle the social and societal discomfort that leads to this lack of literacy in the first place, i.e. the taboo associated with a woman's body (Rossmann 2008). Critical design is one approach that has worked toward making visible the female body in all its guises. The Menstruation Machine (Sputniko 2010) is a critical wearable design provocation that replicates the experience of menstruating and interrogates this bodily function as desirable in a foreseen future. 'Kegel Organ' (Lewis 2011) is a response to a wearable technology studio brief to designing for body parts that are usually forgotten or neglected. Additionally, art-based interventions such as 'The Great Wall of Vagina' (McCartney 2011-present) contribute to create generalized awareness of body taboos by elevating intimate body parts, typically confined to one's private realm and removed from public view, to the white-walled gallery and media spotlight. At an even wider level, social media can and does play a role in 'breaking down the barrier of taboo', and particularly as a vehicle for promotion of preventative health practices. For example, the cervical cancer campaign 'Smear for Smear' (JoTrust 2015), has aimed to create a wider awareness of the

importance of smear tests and encourage younger women in particular to be tested. Alternatively, as a platform to support reclaiming the body, women have 'live-tweeted' menstruation to restate embodied identity in response to the public derogation of women (BBC 2015).

5.5.3 *On Care Prescriptions*

Charlotte recommends an NHS approved PFMT app (NHS 2013) to her patients, which describes how to do PFME and reminds a woman, through alerts on her phone, to undertake her training according to an agreed (in consultation) schedule. Technologies such as this are available for free or at a small cost, and suggest a relatively recent proliferation of women's health interventions within the public sphere. These apps often aim to promote women's health and intimate care by building capacity by engaging with and supporting healthy behaviour over time. Common topics include menstruation diaries, pregnancy trackers, and contraction timers. However, these apps might be viewed as exacerbating the disembodied understanding of the self and intimate parts of the self, since they may disengage one from their body. Evaluation of designs that push the boundaries of *self-knowledge* and *knowledge of others*, all the while considering a cultural taboo as a design material, was recently introduced in (Bardzell et al. 2015), and the design of Labella, which I will discuss in Chapter 6, also attempts to show how technology can contribute to breaking down the taboo to help reduce the barrier of self-care, by suggesting that the notion of taboo around this body space might benefit from the support of embodied technologies to encourage looking at oneself. Moreover, projects such as (Bichard et al. 2012), which promote continence care in the community with a focus on reducing social stigma, point out the need for establishing and improving relationships between patient and clinician and the way in which decisions are made. By considering body-worn (smart underwear) and on-body (colour change odour detector) devices it is suggestive of moving forward mechanisms that would support the individual in managing their incontinence in everyday life, by notifying them of leakage or body odour, for which they are alerted and can take prompt action. Similarly, mobile apps and 'smart' objects that support PFME (Chiaro 2015, Minna 2014) point towards the raise of individual responsibility, serving as a reminder to exercise which, of course, only the woman can decide whether she complies or not. In this regard, technology has the possibility to support not only remembrance but also fitness tracking. However, technology that supports making this intimate workout visible, i.e. talked about, visualized, or shared in collaborative networks that may support development and lessen the taboo of looking at and knowing about oneself, is withdrawn from clinical settings just as much as digital technologies available for

the individual. I therefore suggest that wearable and mobile systems for women's health and intimate care consider the implications of these experiences, i.e. preventing, maintaining, or remediating incontinence, generally enacted alone, and recognize such as a positive challenge to HCI design, to negotiate privacy boundaries and succeeding acceptability of technology, and an opportunity to innovate in, for example, wearable sensing (e.g. smart textiles and analysis on wear or fitting) or encouraging exercise in public designated spaces (e.g. implement a data logging system for measuring PFM strength in specialized gym equipment). The latter could include elements of competitiveness, as data could be shared to encourage gamified learning.

5.5.4 *On Taking Charge*

Charlotte's prescriptions, which typically include pelvic floor muscle training based on an amount of exercising a day, rely heavily on the self to succeed - both in terms of knowing how to exercise, and remembering to exercise. It is based on this individual responsibility, the transfer of power to care for the self, that the outcome of health is made visible. Furthermore, knowing and remembering to care for the self does not solely need to be framed as a remedial activity, or one of maintenance, but also one which reduces the need for formal care interventions. An interesting example of (not) 'taking charge' that I encountered in my observational study was the case of the pessary. Here, a woman who is aware of her body can have the option to insert and remove the device when in need and without clinical intervention as one way of controlling urinary incontinence. However, Charlotte is reticent to prescribe such measures, noting that the NHS rarely make use of these interventions in part because women have difficulty fitting them correctly. I can clearly see the entanglement of knowledge of the body to women's health, and the problems that arise in proactively caring for the self when body literacy is insufficient.

Reliance on the self and on others is marked by a shift, and new frontiers need to be re-scripted. Nevertheless, the intimacy involved in this bodywork may require embodied interactions that benefit from self-knowledge or tangible interactions that require manipulation and touch by others. At a time in which the woman patient is mostly reliant on and becomes subjected to the institution to choose the medical interventions that will offer her the best care and comfort, empowerment occurs when alternatives to the existing status quo support her in becoming the subject of her response through learning and promote trust across the personal and professional communities. Technology use and design impacts the nature of the outcome of subjectification (Bardzell et al. 2014), and by examining the asymmetry highlighted in the qualities of intimate care (as described in Chapter 2) within HCI research I

open the discussion that place life disruptions, such that of the body, as a future lens to relate to possibilities of intimate technologies.

Technology has a profound mediating effect on the way we relate, obtain knowledge, and contribute to society (Peer et al. 2013). Most technologies configure their user as a consumer and not as an active participant, and the rise of DIY (Do-It-Yourself) approaches to what once was inaccessible or institutionally bound technologies create opportunity for change. A study such as (Balaam et al. 2015) proposes an alternative approach to finding places to breastfeed in public spaces by empowering members of the community, presumably sharing similar concerns, to contribute their knowledge by reviewing locations on a mobile app. While women are reliant on members of the community to leave accurate reviews, it is also an example that demonstrates how a work of social computing benefits a personal, individual act, while empowering a community of women as activists for personal wellbeing. Other such example is 'The Great British Public Toilet Map' (RCA n.d.), which complements TACT3 research (van den Heuvel et al. 2012) and provides up-to-date information on UK's public toilets in a designated area, to both support people in finding facilities and "encourage local authorities to provide an maintain public toilet information as open data and in a cost effective way".

But, there are more radical opportunities seeded within DIY communities and HCI literature that could offer new perspectives of women taking charge of their intimate health. DIY practices have already been explored to introduce opportunities and concerns for HCI (Kuznetsov et al. 2012), and as tinkering outside professional settings proliferates, supported by the advent of open source, it has led to new approaches to design science and its apparatus. One example is that of DIY gynaecology, headed by (GynePunk Lab, 2014) who develop open-source tools for DIY diagnosis and first-aid care in support of women to take control of their reproductive health, and recently (GaudiLabs, 2014) developed a 3D printable speculum, which aims "to democratize and "liberate" the instruments and protocols used in obstetrics and gynaecology to allow low-cost diagnosis" (Chardronnet 2015). Can one imagine then, it becoming the norm for women to conduct their own pap smears at home at timely intervals, or at times when they are concerned? And, if we can, how do we imagine women dealing with and making sense of this intimate data? Crowdsourcing of such women's health data could be one viable alternative for coping with disruptions to the body as well as seeking social and expert support from others. For example, if women are happy to share health information in an online breast cancer community (Skeels et al. 2010), places to breastfeed in public (Balaam et al. 2015), or information about their menstrual cycles (Chenette & Martinez

2014) then maybe we can also imagine women sharing the results of their home-based cervical examinations, or pap smears with the 'crowd' to help interpret the data. Such innovations open the potential for innovation in women's health, and potential disruption of women's health practices globally. For example, while one sees GaudiLabs currently developing 3D printing templates for a traditional speculum (GaudiLabs, 2014), perhaps through the community's practice and self-exploration we will see 3D printing templates come available that improve women's experiences on this front, relegating the traditional and troublesome speculum to the past for good.

5.6 Summary: Intimate Care Work

In this chapter, I presented fieldwork completed within a women's health physiotherapy consultation. This observational study offered me insights into the practice, tools in use, and accounts for the women's experiences while being cared for by Charlotte. Furthermore, it makes concrete that, while certainly there are challenges to designing technologies for intimate care in women, there is a wealth of opportunities in addressing this interventionist space for HCI research and design. Particularly, with a focus on innovation in the design of technology systems, i.e. rethink, redesign, and develop processes that can support body knowledge in health self-management and/or diagnosis.

The challenges of designing for women's health traverse relationships between the institutional and the political, patient and doctor, the self and her body. Whereas the challenges are real, the opportunities for change are immense. These can include the redesign of medical devices that touch the body, as suggested by both the medical professional and patients, through exploring methods that innovate technologies that enable care of the self - and the other – in ways that de-medicalize said experiences, for example, using DIY/citizen science approaches to provide alternatives to institutional care and promote self-care. HCI accounts for such research explorations and directions within different fields that also involve health and the body, for example, in food (Kuznetsov 2012). Embracing topics of taboo such as the ones intertwined with the intimate care in women could also suggest new directions to understand and de-stigmatize the design of technologies for such bodily interactions. While the *challenges of designing for women's health* extend across disciplines the *opportunities to HCI research* include driving innovation in systems that highlight and attend to human-technology relationships. Moreover, advancing the design of human-technology relationships will help to and support the outlining of new policies that could benefit women and their care.

This Chapter outlined my experience as an observer in a women's health physiotherapy consultation room, and considered and reflected on the requirements to designing technologies for the intimate care of women. In the next chapter, I introduce the design of a toolkit and discuss this toolkit's deployment with communities of women. I research through design to explore understandings of knowledge in relation to the biological body and women's experiences in health and self-care. In doing this, I consider and reflect on the design requirements to designing technologies for the intimate care of women, such as pelvic fitness, and more broadly, on how to promote intimate bodily knowledge.

Chapter 6. An eTextiles Toolkit

6.1 Introduction

This Chapter describes the first practical element to the research. It derives from my fieldwork experience as an observer in a women's health consultation room to encompass the design of a toolkit intended as a catalyst for discussion. This toolkit attends to the woman-centred approach introduced in Chapter 3 to challenge current approaches to designing artefacts and technologies in support of body (self)knowledge, as pre-ambled in Chapter 4.

Figure 10: 1) Screenprint of pelvic floor muscles (Gosforth Academy); 2) cutting the pattern and assembling it during the workshop; soft circuit with knickers (a. The Angelou Centre; b. [5 images] Culture Lab, 40s-50s workshop).

The toolkit was adopted and adapted throughout a series of four workshops that I conducted in order to explore knowledge of pelvic fitness and body literacy in women. This Chapter includes documentation on the decisions regarding the design of the toolkit, a description of its components, and how the toolkit was applied within a workshop setting. I continue by presenting extensive data from the four workshops that took place between December 2013 and June 2014, and finally reflect on these data to unfold opportunities for design that address women's concerns and bodily experiences.

6.2 A Design Rationale

This exploratory study began by addressing fitness of the pelvic floor in women. With a focus on preventative care practices and incontinence as a condition that can be assisted (prevented) by pelvic floor exercises ('Kegels'), I wanted to design a toolkit to be used within a creative workshop setting. This toolkit would include tangible visual media and on-body interactions to support learning about intimate body parts and their functions. Moreover, my interest in this approach comes from my creative practice and my interest in on-body interactions, wearables, and e-textiles. With this in mind, I was keen to explore smart, wearable materials as method to research intimate health and wellbeing.

The goal was to explore ways digital technology can contribute to create awareness of the pelvic floor and to demonstrate how the pelvic floor muscles work. In doing this, I designed a toolkit that starts by inviting participants to recall existing body knowledge, and expand on that same knowledge through a hands-on process of do-it-yourself (DIY) discovery of and 'on' the body. This comprised of putting together a part of the hidden anatomy by integrating technology and intimate apparel. In conceptualising this toolkit I considered qualities of intimate care as defined in Chapter 2, and focused on approaches that would potentially engage women in such topic of taboo while in practical contact with technology. This woman-centered approach accounts for the design of the workshop activities by interweaving aesthetics and the material landscape of electronic textiles with the body and the quality of touch. In taking a woman-centered design approach, I wanted to position the toolkit within a broader contemporary feminist discourse, but particularly situate it within feminist HCI (Bardzell 2010, Rode 2011) and set to outline a possible agenda for intimate care in HCI research and design. Designing technologies that talk to women and engage us in becoming more literate about our intimate bodies and in control of our health and wellbeing is critical, and this study was a first stepping stone in doing so.

As introduced in Chapter 2, the female body has been widely documented and researched (Braun & Wilkinson 2001) however showing that there is a visible lack of everyday knowledge among women and misconceptions are common amongst all of us. Further, as presented in Chapter 5, anatomical models are generally used within the clinic to explain parts of the body but accessibility is limited to women unless they become patients. To understand what women know and do not know, while challenging traditional modes of learning and sharing knowledge, the eTextile toolkit provided material and on-body interactions, body mapping and DIY wearable eTextiles, as catalysts for conversations and unconventional devices for breaking the taboo on the topic.

6.3 Encouraging Pelvic Fitness among Women

The design toolkit aimed at helping women to learn and explore human physiology and anatomy, doing so by introducing the role of the pelvic floor muscles in continence care and core stability. The pelvic floor muscles are the only muscle group in the body capable of giving structural support for the pelvic organs. The goal was to develop a design toolkit to help women understand how important these are for their lifelong wellbeing and also how crucial it is to exercise and keep them healthy. Originally, the toolkit was designed for young women. Eventually, it was deployed with women across a wider age range, as I will describe in 6.5.

Initially, the workshop served to have young women to work with me to evaluate this new tool of body-worn technology that would support new perspectives and new ways of thinking about our bodies in a way that would be fun and playful to learn with. This was a first trial of a design toolkit that I wished to implement for young women across different schools in the future. Nonetheless, and in spite of the fact that this toolkit was intended to and focused on pelvic fitness, discussions around the activities unravelled numerous questions regarding basic body knowledge. The outcomes of this workshop showed evidence that taking a step back and ‘going back to the basics’ may be a requirement for designing around such sensitive topic, and creating awareness of and grasping a more comprehensive understanding of the female body needs to be highlighted in health and wellbeing education. To further address this noticeable need, I decided to deploy the toolkit in a second workshop, this time with adult women of different ages and cultural backgrounds. Similarly, this workshop consolidated the view that basic knowledge might be hindered by the taboo of the topic and by the lack of resources available for well women across the lifecourse.

These two workshops had highlighted the value of exploring body literacy spanning different age groups in varied communities of women. Young women and adult women displayed a range of knowledge that relates to formal learning, social learning, and personal experience. In light of this, and in order to further emphasize such outcomes as potential factual data, two more workshops were held, one with a group of women aged 20s-30s, and the other aged 40s-50s. Similarly to the previous workshops, women worked on the making activities and shared experiences based on relational knowledge.

6.4 The Design Toolkit

6.4.1 *The Activities*

As described in Chapter 4, the toolkit consisted of two sets of materials for the following two activities: body mapping and DIY Wearable eTextiles. Materials for these activities consisted of:

Activity One (Body Mapping): Materials included a pair of knickers as the visual medium, and fabric markers to draw on it. To engage women in the topic of pelvic floor and to encourage them to use biological language relating to their sexual organs, the first workshop activity proposed with this initial set of materials was a body mapping exercise. Body maps, a qualitative method generally employed by medical anthropologists, can be used to exercise knowledge and access people's perceptions of their bodies. Women in these workshops worked in pairs to create and discuss a body map. The body map was framed for intimate care with a pair of knickers, and they were asked to illustrate their reproductive organs on the material.

Activity Two (DIY Wearable eTextile): A ready to assemble wearable pattern of the female pelvic floor, which consisted of a screenprint of the pelvic floor muscles on fabric and a pair of knickers. These two items integrated sewn electronics – a soft circuit made with conductive thread and conductive fabric, and metallic snaps. The eTextile included a detachable piece of wearable electronics that consisted of a laser cut fabric circuit, an ATtiny85 microcontroller, and 3 LED lights.

6.4.2 *Setting up the Workshop*

The design workshop functioned as a collaborative field site in which I combined an inter-disciplinary approach and inventive methods to making.

The **first half of the workshop** was planned to start with the body mapping exercise with the duration of (average) 30 minutes. The session would then continue with an introduction to the pelvic organs. Having learned about the pelvic organs – that it encompasses the reproductive system and external genitalia, bladder, and rectum – I would then distribute the second half of the design kit. The second half of the design toolkit consisted of materials to explore the anatomy of the pelvic floor: a fabric print of the different muscles that constitute the pelvic floor; a pair of knickers; a handout that showed how to assemble the fabric print; a handout that detailed what the pelvic floor is and how to find it (figure 11).

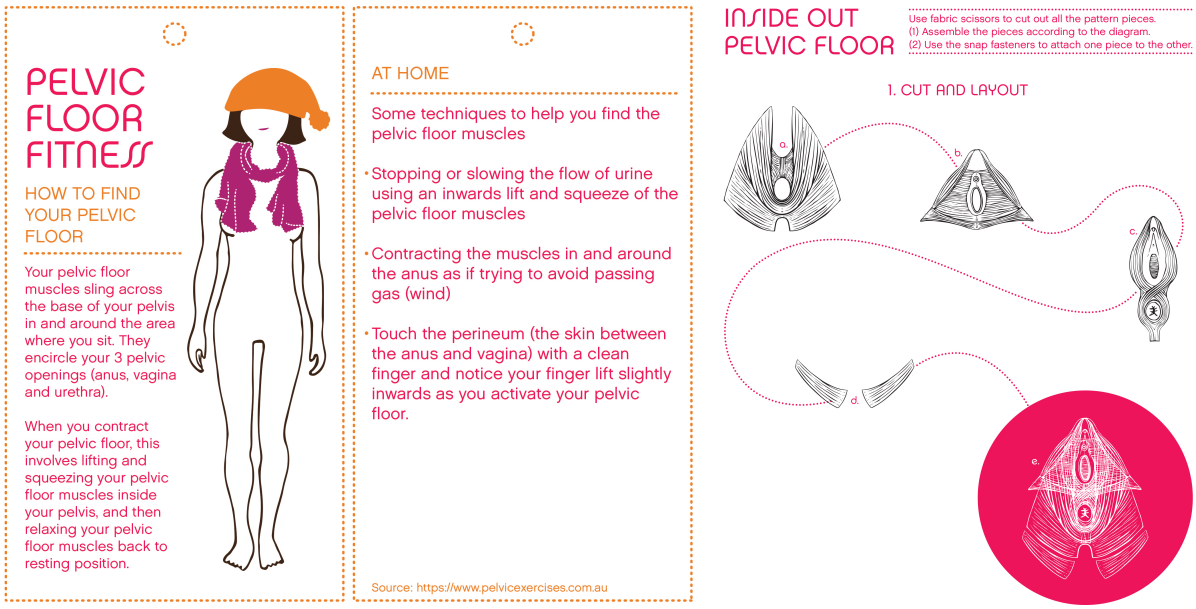


Figure 11*: Left.* Handout (what the pelvic floor is and how to find it); *Right.* Handout (how to assemble the fabric print). Visual design: Ephrat Seidenberg; Pelvic muscles illustration: Sophie Fernandez

The **second half of the workshop** consists primarily of making the e-textile. By appropriating the flat pattern concept and method employed by patternmakers in fashion and apparel, a screenprint of the different muscles in the toolkit is ready for cutting. This screenprint is equivalent to a sewing pattern block, ready to cut out and assemble. After assembling the pattern of different muscles, it then renders visible the structure of the pelvic floor muscles as a whole. Afterwards, they were to assemble it to a pair of knickers. The knickers were already prepared with a hand-sewn circuit of conductive thread and paired halves of metallic snaps to attach the pattern to. Once the pattern had been correctly attached to the knickers a detachable soft circuit board would be connected to the circuit threaded on the knickers. This task completed, the LED lights on the soft circuit board would light up in a sequence with one second interval inbetween all the way up and then al the way down to simulate a ‘contraction’ and ‘relaxation’ movement.

After exploring ways to attach the print to the knickers, I continue by introducing information about pelvic floor fitness, specifically pelvic floor muscle exercises. The ultimate goal of the workshop is to understand fitness, and finalize the activity by combining a wearable piece of electronics turning the knickers into an e-textile. This e-textile provides a visual simulation of the muscles contracting and relaxing, intended to stress awareness of the pelvic floor morphology. This last step on making the e-textile involves connecting the small bespoke soft circuit board to the circuit threaded on the knickers.

Lastly, in igniting a conversation on and around incontinence, I introduce information about possible causes and likely symptoms. This is intended to open up discussion about pelvic fitness and pelvic floor muscle exercises.

The first workshop took place in December 2013, with a group of young women at a local secondary school, and it consisted of making activities to explore and discuss perceptions of the body. I considered the results from this initial workshop to resume iteration of the toolkit with a larger number of women of varied backgrounds and age groups. Awareness is key and these workshops provided insight into intimate anatomy and suggested knowledge and understandings of the body can be enablers to adoption of care practices.

6.5 The Design Workshops

In this section, I describe the four workshops delivered with different communities of women. In 6.5.1 I describe the first workshop, which was designed specifically for young women aged 15-16. Whereas the initial planning evolved around young women, the iteration with the toolkit in such workshop environment led me to consider the possibility of exploring a similar approach and materials with other communities. With this in mind, I decided to explore the design of the toolkit for cross-cultural workshop deployments, and in 6.5.2 I describe the second workshop that took place at The Angelou Centre within a group of adult women with a multitude of backgrounds, mostly South Asian. Consequently, but more specifically the workshop with young women, I also decided to iterate the toolkit with communities of women in different age groups, as described in 6.5.3. Each of these workshops was (re)designed to suit the specific community in ways that would facilitate knowledge of the body through the artefacts at hand and supported engagement within that particular group.

6.5.1 *At the Gosforth Academy*

In December, 2013 I delivered the first design workshop with a group of six female students, aged 15-16, at Gosforth Academy. The workshop was configured as a set of two sessions, 50

minutes each, so it would suit the allocated time of the official class in which it had been integrated, Life Skills. Life Skills was a course she developed in collaboration with another teacher, to accommodate certain students for whom was probably not a good idea to take other courses, such as languages e.g. German or Spanish, subjects they would probably struggle with. Instead, this was a lesson in which their learning skills would help them in confidence, learning about the world and allowing them to have time to concentrate on GCSE (General Certificate of Secondary Education) coursework instead. Whereas such a course may exist in other schools it would be different in every school, Jacqueline (Jackie) acknowledges. By the time of this workshop she had a total of eight girls taking the course, and this was the second year they had been together (the course had started in June 2012). Originally she had started with eleven students but with time one of the girls became pregnant and left to go to a special facility for under-aged pregnant girls, another one had significant emotional problems and started going to a learning mentor instead, and one had been withdrawn from the lesson by the learning mentor to catch up on coursework for GCSE.

In terms of demographics, the remaining girls taking the course: one had a white British background, one had an Indian Hindu background, the remaining girls were of South Asian Bangladeshi Muslim background, and four of them wore a head scarf. Regarding the reason these girls are taking the class, she thinks that it was *"just the way that it happened, I suspect they were friends and just decided to take the same subject. Specially the South Asian girls, I think they were given the opportunity to choose Life Skills and they chose it so they would be together, I think."*

Some of the topics covered in Life Skills include learning a wide range of chores, such as washing underwear by hand, ironing, or setting a table for a dinner party and how to use a knife and fork correctly, to discussing politics, reading newspapers, or even creating a social enterprise. Jackie comments that when the students first started the course they were very quiet, and lacking in confidence. Such mix of home economics and socio-political engagement, added by the fact that they are not with the boys, she thinks, seems to have increasingly made the students more self-confident. However, Life Skills would see its end that same academic calendar. The education system in the country changed and exams have become harder, Jackie remarks, and different regulations probably mean that students will be having more English lessons, as indicated by recent mandatory English Literature and English language (versus English language only).

As I finalised designing the toolkit, I took the invitation from Jackie to visit the school and the Life Skills class, where I had the opportunity to introduce myself to the students. During that initial visit, I told the students briefly what was it that we were going to be discussing during the two sessions workshop, should they agree to participate. I described the topic of pelvic fitness and what it related to generally, I distributed the information sheets, consent forms, and opt out forms for the parents. The aim was to understand whether this topic would be something that they would like to partake in. Although initially shy, the students engaged easily in conversation, asserted their interest in participating, and asked me questions concerning the topic. The topic was intriguing to them and made them giggle, which I thought was a good omen considering the taboo invested subject that we would be dealing with. During my first visit there were eight students attending the class. Two of the students decided not to take part in the workshop (one of the students had an opt-out form from her parent), and were to remain in the classroom while working on their homework. I returned two weeks later for the first-half of the workshop.

I returned to the school a few days later after the two-session workshop to have an informal conversation with Jackie. I was interested in knowing her opinion on what had taken place, just has what were her thoughts on the toolkit within/out the classroom. In her PSHCE class, Jackie has a group of with 34 students. Usually, such class involves mixed gender students and a minimum of twenty-five students per classroom. She is unsure the toolkit would work particularly well in this context, a) possibly boys may not be interested in it; b) the girls would be interested but because it is a mixed gender class that could create embarrassment; c) the teacher might not have the necessary knowledge and the way a teacher delivers makes a difference. Within my workshop, and the Life Skills course, I had a small number of students, which made it easier to facilitate and assist each one individually. Her suggestion is that such toolkit would be good in the school where the girl who was pregnant went to, or the Girlguiding Association, youth club place where girls meet weekly and start going to when they are 11 or 12. Other places could be those in which I would likely encounter women who don’t know about the topic such as women’s refuges, or continuing education. Also, I could look into a different age range, 16+, or vulnerable teenage pregnancy units; ante-natal workshops; women's institute organizations.

My next steps involved planning a series of workshops that were diverse in participation and socio-cultural backgrounds.

6.5.2 *At the Angelou Centre*

In early 2014, I met Rosie. During this earlier introduction, she suggested I would run the workshop at The Angelou Centre, a black-led women's centre based in Newcastle. The centre "exists to advance social inclusion and economic independence for black and minority ethnic women, children and young people through: services and activities that enable them to overcome barriers (including abuse and violence) and achieve their full potential as well as ensuring that their voices are heard and inform policy and practice at all levels." (The Angelou 2016). This could be a different approach to learning, by focusing on health and knowledge of the body while making e-textiles. Additionally, the workshop during which I met Rosie, I met Liliane. Liliane is a carer for the elderly and was a volunteer at the centre. In conversation about my research, she stresses that people all ages may not be aware of topics such as pelvic muscles and fitness. She recalls this event when an elderly woman she was taking care of needed help to go to the toilet and barely could control her bladder. Liliane helped her getting up and told her to "squeeze", to which the woman responded by squeezing Liliane's hand.

Rosie gathered a number of women, who attend and are involved with activities in the centre, for me to meet and explain my research, and check on their interest in participating. Some of these women I had already met in 2012 during a previous visit they had had to Culture Lab, in which I had the opportunity to show them some e-textiles I had made. At the time, they were enthusiastic about it and eager to learn more, surprised by the use of electronics in fabrics and their potential application to clothing and accessories. When we met again, during my initial visit to the centre, they remembered our previous encounter at Culture Lab, talked about the textiles and showed interest in doing activities together.

Similarly to my first visit to the school, I started by explaining what this workshop was about and how it related to my ongoing work, and that it would involve e-textiles to learn about intimate parts of the body and conversations around experiences and care. They were instantly intrigued and accepting to participate. Amid laugher and teasing each other, they promised me they would come back with a lot of questions. I returned to the centre to give the first session of the workshop a week later.

6.5.3 *Generations: 3rd and 4th workshops*

At the time of the second workshop, my interest included adult women whose cultural backgrounds were varied, whereas a series of future workshops were to attend to different age

ranges, namely 20s-30s, 40-50s, and 60s plus. A third and fourth workshops took place at Culture Lab with two groups of women, one within the 20s-30s and the other 40-50s. As mentioned earlier, a workshop with women 60s plus as originally intended was not viable in the end.

Contrarily to the group of young women at the school and women at the centre, women participants at the remaining two workshops were recruited individually. All were contacts made by myself within the university (PhD students, research associates, administrators, lecturers) and, for the most part, they did not know or were acquainted with each other. Generally, and despite the subtle hesitation that I sensed in some of the women, they had accepted to take part out of curiosity. Pelvic fitness is not something that is taught in school or something one thinks about unless there is a disruption to the body, and for the most part only women who have gone through childbirth would have heard about it.

6.6 Exploring Body Literacy in Intimate Care

In this section, I introduce the data gathered across the four workshops. These findings account for the activities with students at the Gosforth Academy through using the toolkit with women at The Angelou Centre, and varied women aged 20s-30s and 40s-50s. Moreover, this section underlines how the design and application of innovative methods and approaches, in the case introduced here one supported by technology-enabled materials and embodied perception, can contribute to shape and strengthen knowledge.

6.6.1 *Making connections to knowledge*

Within these workshops (young) women worked side by side to create and discuss a body map. My intention with this first activity was to use the knickers as a visual guideline for them to think about what they know on the reproductive system. By doing this, I intended for them to have an allocated time and recall knowledge of the body from memory, and hold conversations amongst them while transferring impressions and visualising parts of that system in a tangible surface. This activity would also work as an ice-breaker to get them comfortable with each other and within the workshop setting, by encouraging them to make connections to knowledge and become aware of the body space being studied.

Figure 12: Body mapping; drawing the reproductive and sex organs on knickers (Gosforth Academy)

I explained briefly what they were to do for the first activity: to sketch or draw what they know about the reproductive system and associated external organs. For most part, such 'request' caused instant reactions of surprise and giggling questions started to emerge. They wanted to be sure that it really involved discussing and drawing what is mostly a taboo, sex related organs. Making sure that it really is, Dana asked: *"Do you want me to draw a vagina?"*, causing all the girls to laugh. Moreover, questions also arose in relation to the visual medium as a space mapped to the body. This was a piece of white cotton classic briefs, size medium, which was intended to represent the area loosely and did not cover the entirety of the pelvic naval area, such as high briefs do, especially when laid flat on the table and not worn. The potential knowledge of this body space is observed by Dana, in her hesitation to draw within the constraints of the knickers:

"*Miss, I don't know… how can you like… draw the organs, if the organs aren't there but are like there, here… on top of the line thing…Cause the ovaries and stuff are over here and there's a line, and the vagina there."* (Dana)

The discussions continued through the session and centered around the women' perceptions of intimate parts of the body, and combined both the use of biological and colloquial terms. Amid the students the use of colloquialisms was prevalent, and uncertainty regarding the internal anatomy of the reproductive system was occurring:

"*These are the ovaries and that's the little eggy thing, that's there… And then, the other holes, that's a thing...* (Dana)
Ok. What else is there, do you remember? (Teresa)
And that's it... Vuvu. (Laughs) (Dana)
Yeah, yeah it is. Do you remember any other organs besides the ovaries? Well, and the vagina. (Teresa)
The uterus... (Beatrice)
Like the thing that holds the urine and stuff inside it. What it is called… (Dana)

You need this. Miss, what you told us… (Beatrice)
The uterus. The clit bit. (Dana)
The uterus. The clitoris is part of it, but it's not exactly in the same place as the uterus." (Jackie)

Colloquial language was largely used to refer to these intimate parts. In part because they did not know the biological term, e.g. the urethra was only know as "pee hole" or "wee hole", but also because biological terms, such as 'vagina', appeared to be more intimidating to say out loud other then slang words, e.g. "vuvu". While they vaguely recall having learned the vocabulary in school, lingo as such was acceptable and relatable among this group of young women.

During the body mapping session, I used oral quizzing while adding biological terms for the sex organs on the classroom's whiteboard. As the session progressed, I discussed the vocabulary with them, using a cross-section illustration of the reproductive organs and pelvic floor, which I had prepared on a keynote presentation and had projected on the classroom's white screen.

Figure 13: Sketching reproductive and sex organs on paper; positioning words on knickers; holding the knickers in front of her body to help her understand where the internal organs are situated (The Angelou Centre)

Mapping out in and around the body amongst women at The Angelou Centre evolved around first-person knowledge in relation to experiencing childbirth. For instance, in order to gain a better understanding of the location of the reproductive and pelvic organs, Anna held the knickers close to her body as if wearing them (figure 13). She voices to others:

"The bladder over there… It's not bladder, bladder is over there. I'll see, because I had three caesareans!" (Anna, checking on her own body) [workshop The Angelou Centre]

The use of casual language to talk about sex organs was less obvious in this workshop. Based on Jackie's suggestion of adding the words to a board, I added a set with written words (that included the reproductive organs and the pelvic organs) to this toolkit (figure 13). One concern for doing this, as pointed out earlier, was the fact that women didn't have English as

a first language, and to minimize a possible language barrier while encouraging learning of anatomical terminology in a second or third language. Nonetheless, women acknowledged that they would not have known all the biological terms if asked in their own mother tongue. The set with written words was added in hope that it would make the exercise both more engaging for discussion (a starting point) and supportive of making familiar what otherwise might not be at hand. These seem to prove helpful in not only figuring out the layout of the pelvic body but also in making clearer and easier to understand what composes this body:

"Basically, there's… (Sarah)
There's 2 ovaries... (Martha)
Is it? (Sarah)
Two ovaries? She thought it was only 1." (Helen) [workshop Angelou Centre]

Vocabulary associated with the pelvic floor anatomy presented some limitations, as did the reproductive organs functions:

"Urethra… urethra? Where is it? (Anna)
Where does baby stay, ovary or uterus? (Helen)
And pelvic floor, is near to the uterus? (Mia)
It's not next to the uterus. (Teresa)
Where is it…? (Anna)
It stretch like this (Laughing) *and then the baby come out."* (Mia) [workshop The Angelou Centre]

Similarly to the students at the school, uncertainty was a common feature while working on the body map. However, in the case of women at the centre, they were able to make connections to knowledge based on personal experience. Likewise, women in age groups 20s-30s and 40s-50s recognised their limited knowledge and the needed skills to accomplish the task in hands. The immediate connections are made through remembrance of formal learning or area of expertise:

"*Here?… I have no idea…* (Jennifer)
It's something like this, I think... they know it very well... it's obvious that I'm from computing science background… (Mary)
So these are the tubes… (Emma)
I'm also terrible at drawing… (Jennifer)
I think it looks pretty good so far. (Emma)
So the cervix is the entrance? (Jennifer)
Yeah. Because babies, when they're born, that opens…" (Emma) [workshop 20s-30s years old]

"*The pelvic floor… It's behind, it must be behind…* (Claire)

Can't all be just there… (Barbara)
It's a heck of a long time since I did biology! (Claire)
So it's like there. (Barbara)
Are we supposed to… (Claire)
I don't know… (Barbara)
Oh, what else is in the pelvis?" (Claire) [workshop 40s-50s years old]

6.6.2 *Knowledge in Anatomy*

Alongside colloquialisms, the anatomy of the female perineum was nevertheless mysterious for some of the young women. While working on their body mapping exercise, Dana and Beatrice engaged in a conversation around parts of the anatomy:

"*There's no wee hole, there's no wee hole.* (Dana)
There is! (Beatrice)
The wee hole and the vagina is the same thing. (Dana)
No it's not! Oh my god… (Beatrice)
You only got 2 holes! (Dana)
No, you've got your thingy… (Beatrice)
There's 3 holes in there. (Eliza)
There's a hole there, there's your vagina, there's your bum. (Beatrice)
Is it?! (Dana)
Yes. Also, do you know the name of that pee hole? (Teresa)
"Wee hole, pee hole, is it?" (Beatrice) [workshop Gosforth Academy]

Dana was astonished with the fact that she had three openings on her perineum: the urethra, the opening of the vagina, and the anus. Moreover, this appears to be fairly prevailing knowledge among many, as seen in (Braun & Wilkinson 2001). Learning such factual information about this part of her own anatomy was surprising and led her to question and further enquire her anatomy in relation to sexual function and morphology:

"Oh my god, is that three holes, so there's three holes???" (Dana)
Yeah!! (Eliza)
How can you think that? (Beatrice)
Oh my god… so can you put it… you know when you have sex… can you put it in the first hole as well? (Dana)
No, it's toooo small. (Eliza)
It's sooo small, is it… it doesn't expand, doesn't do anything." (Beatrice) [workshop Gosforth academy]

Nevertheless, this activity allowed for open conversations among them, informal discussions between them and myself, and it served both as a conversation starter and a guide to the activity that followed.

6.6.3 *Body Inside Out*

At Gosforth Academy, which workshop was divided in two separate sessions (due to class schedule), five of the students attended the second half of the workshop, one of them having had already been absent throughout the morning. I distributed the toolkit back and they continued to finish cutting and assembling the pattern, guided by the handout and fitting the metallic snaps in the correct place (the snaps were of assorted sizes). Understanding and placing the print of the muscles in the right place caused hesitation among the students. The handout provided showed a visual step-by-step on how to assemble the pattern, however did not show how to assemble the pattern to the knickers. To do so correctly, one should understand the positioning and location of the perineum, in this scenario to visualise the body part within the limitations of the knickers and the soft circuit already on them.

In cutting out the flat pattern, women and girls engaged in exploring the materiality of the fabric in hands. The touch and feel of the material was valued by them and the detail of the illustration was intriguing. They were curious whether I had designed it and how I had produced it. Some remarks included illustrating, colouring and printing:

Figure 14: Cutting out the flat pattern; assembling; attaching to knickers; attaching soft circuit. Workshop at the Gosforth Academy

"*Did you draw this miss?"* (Eliza) [workshop Gosforth Academy]

"*I like this fabric.* (Mia)
You like it? (Teresa)
Yeah, it feels nice. (Mia)
2 colours, you printed 2 colours? (Anna)
You print this colour yourself? It's very nice. This colour is very nice." (Mia) [workshop Angelou Centre]

As suggested by Jennifer:

"Cutting out is a really important process… get a sense of its shape... also the time for me, just the time to think about it… cause if you were just given a leaflet you'd go ok-yap-yap-ok next… whereas if you're cutting it I think you have the time to reflect a little bit… oh, it's a pelvic muscle… you see the structures… I think it's like, it slows you down... with giving you some kind of task." (Jennifer) [workshop 20s-30s years old]

Jennifer acknowledges the tactile nature of the material and the tasks of cutting and assembling as a method to engage in learning. The assembly of the flat pattern was useful to make her start thinking about the body in ways that using an app may not have been so engaging or appealing:

"But I still like the tactile nature of it, I still like... I think... I don't want to generalize but I think women like doing things, cutting things, with their hands... and I still think, for me that was actually a big pleasure to just like cut it and see it, overlap it... I still think… I think there must be something... a connection between having an app, something very cold, very computer-ish, and getting to know your body touching you can't touch this so I hope you still consider… Yeah, and this is why I like this way, it gives you time to think about it, … and constantly do something… you have the muscles… the layers, and you notice how complex they are, I mean some people don't even know where they located, towards your vagina... there is… time to process... so that's why I do like it. What I did like about it, it that it gives you a little bit more time to deal with the issue... you know, if you go to a doctor they give you 15 minutes oh you have this problem, you have this problem, here's what you have to do and now do this or train this and then 10 minutes later you find yourself on the corridor again... ok, ah ha ok…" (Jennifer) [workshop 20s-30s years old]

Moreover, Emma comments on the fact that, by including the piece of underwear, she can relate the activity (and body part) to her own body more easily:

"I do like it's on panties because it just helps in really finding the location and just see the extent of the muscle as well." (Emma) [workshop 20s-30s years old]

The e-underwear

When first seeing the array of LED lights lighting up, the students at the school reacted enthusiastically surprised. It made them giggle and they were eager to try it on themselves. Eliza instantly asked if it was ok to wear the underwear:

"*Can I try it on?* (Eliza)
You can try it on if you want to. (Teresa)
You're gonna try it on!!" (Jamie)
Eliza tries it on (All laughing out loud) [workshop Gosforth Academy]

As awkward as the e-textile might have looked, it granted a space to laugh and make fun of oneself. They were surprised by the LED lights, and confused about it worked, as they were unsure about how it was connected to the exercise or, at the time, what the exercise comprised exactly:

Squeeze what…? (Eliza)
Squeeze down there! (Beatrice)
Oh my god, my vagina is lighting (laughs) (Eliza)
Should I do it…? Oh my god, look at your vagina. It's all light! (Laughs out loud) (Carla)
That's very funny! (Dana)
That's mad…" (Eliza) [workshop Gosforth Academy]

Nevertheless, wearing the underwear was not a requirement for the workshop (as stated in the information sheet), and women in the other three workshops were happy with the conversation, and making and assembling only, not showing the same 'enthusiasm' to put the underwear on.

6.6.4 *What's Normal?*

In order to introduce the topic of incontinence, as linked as it is to pelvic fitness, I asked the students if they had ever heard about giggle incontinence. Giggle incontinence is characterized by involuntary and complete bladder emptying in response to laughter (Berry et al). It is a condition where children and young adults leak urine when they giggle or laugh. This new piece of information made them laugh, and while some of the students had never even thought about the event of urinary leakage as a possibility, Beatrice reported having experienced it before:

"*I think I've experienced it...* (Beatrice)
There was a day when me and Beatrice were walking home and, like,... (Eliza)
Ahhh, I wee-d myself... I don't think I… (Laughs) (Beatrice)

It was that day we went into some random person's car and thought it was my dad… and we started laughing. (Laughs) Oh, yeah! (Eliza)
Do you know… why was that? Was it because you were laughing? (Teresa)
Yeah, she's got it when... low strength… (Eliza)
We basically just walked in to some random guy's car and... (Laughs) (Beatrice)
And she's like ah, that's my dad. (Eliza)
And I was walking home and I couldn't stop laughing, yeah... It wasn't much though..." (Beatrice) [workshop Gosforth Academy]

Giggle incontinence was a condition new to Beatrice and the others, as much as the concept of being, or possibly becoming, incontinent. As per her experience, Beatrice thought it was something that happened to her that one time, the result of exhilaration and confound. In actual fact, the condition is triggered by mechanisms not yet clearly understood by health professionals (Maternik et al. 2015).

Moreover, Irene, at the Angelou Centre, was surprised that such event would happen (the leakage). Explained by other participants in her own language, she had never thought something like that would happen in any situation, let alone when laughing, sneezing, jumping, or coughing:

"Sometimes it happens, yeah… (Anna)
(laughing) she's (Irene) *surprised.* (Mia)
I remember a conversation I had with a friend, we were in a trampoline, she was saying 'I laugh so much a little bit of pee came out'." (all laughing) (Rachel) [workshop Angelou Centre]

Doing PFME can help prevent incontinence, and pelvic floor health can contribute to coping with life/body situations such as delivery, Dana asks*:*

"So does it strengthen your muscles, like, down below? …So when you say exercise, like, if we exercise now our pelvic floors and then we have kids like will our pelvic floors be much stronger, so like… like when pushing the baby out it won't like... it'll be strong, it'll be strong…" (Dana) [workshop Gosforth Academy]

Labelled an exercise for prevention and/or management, knowledge to and how to do it is critical. Beatrice relates 'doing' to her previous incident, as described earlier:

"*I do as it is, so I'm not really...* (Beatrice)
But what helps you remember it? (Eliza)
I just sit, and I… just like, I'm on my phone, and just doing it, I don't know. (Beatrice)
Was that because you were curious about it the other day and you asked? (Teresa)
No, it's because you know that incident I couldn't stop laughing… (Beatrice)

OK, so there was… (Teresa)
It's just, I don't want that to happen again so..." (Beatrice) [workshop Gosforth Academy]

In questioning the (anatomy of and functions of the) body, they wondered whether only an expert, e.g. a physician, would be able to say whether something is right or not, else how to prevent it from going wrong:

"How to know that it is normal… (all laughing) (Mia)
Well, I feel it's not normal like before my one so I can feel…" (Nora) [workshop Angelou Centre]

Discussing the pelvic floor and the symptoms and causes - reasons why it is important to keep it fit, women also wondered if it was a female issue only:

"So is that a female issue, or is it also… (Mia)

What about men, do they also have the same thing?" (Anna)
Yeah, my dad had a bladder problem, so sometimes…" (Nora) [workshop Angelou Centre]

Acknowledging that men also have a pelvic floor and pelvic floor muscles leads to wonder about the relationship between pelvic fitness and childbirth. While most women seemed to think that, and it was commonly understood as, pelvic floor dysfunction occurs only because and after childbirth, and pelvic floor muscle exercises something that one should do only if and after giving birth:

"I mean, I knew a bit before but I've never had children so… I didn't need to." (Susannah) [workshop 40s-50s years old]

"I thought only pregnant women should do this! Ah OK… This problem is not for we give birth for the kids…" (Mia) [workshop The Angelou Centre]

Pelvic floor muscle exercise is also regarded as a *funny* topic, one that is shared among and only by women that give birth:

"And it's never talked about, if you don't have children… you know… it's a joke once you've had children… but no one, someone who haven't had children…" (Vera) [workshop 40s-50s years old]

The lack of practical knowledge regarding pelvic exercises appeared to be the most pressing matter for those who have heard about pelvic floor before, or may have any symptoms of incontinence (no personal disclosure was requested, voluntary information only). In some

way, the exercise had never been explained to them, and none of the participants were familiar with the technique).

"As soon as I had the baby, I came out, she gave me this leaflet, give you a little leaflet… it wasn't a midwife, somebody else came along… and told 'you should be doing this'… (Tina)
Yes, they just say don't forget to do your pelvic floor exercises" (Vera) [workshop 40s-50s years old]

Understanding the space on the body where the pelvic floor sits and how it is critical to other organs is an important aspect of the awareness process. The pelvic floor does not exist in isolation. On the contrary, it is an anticipatory muscle and a supporting mechanism for a great number of internal organs. Understanding what it looks like from the outside leads to better understanding of how it might operate on the inside. However, this is not easy to do, and as we watch a video demonstration and try to accompany at the same rhythm, Jennifer and Emma comment:

"It's not easy. (Emma)
No… (Jennifer)
No, and she's doing the about 10 seconds… (Teresa)
But we don't know if she's actually doing it or not. (laughs) (Emma) [workshop 20s-30s years old]

6.6.5 Awareness and Outreach

Girls/students appeared to have a genuine interest in the topic and the workshop granted them an opportunity to (re)discover an integral part of their bodies: they not only had never heard about the pelvic floor before, or pelvic floor muscle exercises, but also had varied knowledge about their own intimate anatomy. The female reproductive system and genitalia are topics that are part of the national curriculum to be delivered in the classroom, however topics of taboo as such, which may bring about embarrassment, are topics people 'don't talk about'.

The need to keep this part of the body fit, or why it is relevant for general health and wellbeing, was surprising to them and something they had never thought about, despite concerns and questions regarding sex or childbirth. It might have an awkward subject to bring up in class however their openness to learn new things that relate to life skills appeared to be appreciated. Some topics are covered many times while others are not, as Dana and Beatrice remark:

"Teresa, what made you interested in this subject, like… in this? (Dana)
'*Cause no one is really talking about it.* (Beatrice)

A topic… it's really interesting… I think it's really good, learning things we don't know about… like if you learn about the heart, we learn about the heart every single day… (Dana) [workshop Gosforth Academy]

"I think the first step would be to raise awareness of this sort of thing, like… I am married, I never heard about this kind of stuff, it's the first time I'm aware of them. Maybe when I give birth to a child I would find out about it but before that…" (Emma) [workshop 20s-30s years old]

"*It's excellent. And the people want to know more things."* (Nora) [workshop The Angelou Centre]

"*The workshop is clearly very helpful… It's very good for us but not everyone has the chance to attend this kind of things..."* (Emma) [workshop 20s-30s years old]

"*I think, in particular if you want to reach women before they have issues, so might want to think of aiming at like 16, 17, 18 years old and I think that having something on a smartphone is always…* (Joanna)

A*nd also a smartphone is also something you can just read in the private of your...* (Jennifer) *Exactly, and also the thing is very good for with the doctors that the ones that give the instructions to you, to include those this type of things in applications as well because when they give you instructions on a paper or something you just put it in your table and… you know... there forever but then how... in your phone I mean when you're tired of everything and your phone is where you do you Facebook, your everything when you don't know what else to do start checking all other applications (laughs) and you learn things... that's actually…"* (Joanna) [workshop 20s-30s years old]

6.6.6 Reflecting in Uncharted Territory

The learning generated through the designs supported an understanding of what the pelvic floor looks like, and being aware of the reasons why the pelvic floor should be kept fit, the women easily engaged in discussion and related to their own personal experiences. Furthermore, the experience of cutting out the printed pattern was meant to observe the body from an unlikely viewpoint. The action of cutting out was an approach that required material interaction to build body perceptions.

In the absence of suitable knowledge about their female body, many participants sought to learn more during the workshop. The new knowledge about their own anatomy caused surprise, sparked curiosity, and prompted humour and laughter - a common response throughout all the workshops. Whether prompt by embarrassment, self-doubt, or nervousness, to feeling comfortable and supported when talking about and asking about their genitalia and related pelvic floor issues, most women seemed *to be at ease* after starting the session. A

willingness to blend humour with the discussion was present most of the time and in a variety of situations, from speculating possible designs for the technology to being 'suspicious' of the woman demonstrating how to do pelvic floor exercises on a video.

6.7 Summary: Body Matters

The possibilities afforded by the toolkit within the design workshops included the opportunity for women to talk about topics that are usually not shared, or if shared are generally done so in a joking manner between peers, or seriously if within a consultation. Creative methods, such as the body mapping explored during the first half of the group activities, helped the participants in these workshops to share (and challenge) their knowledge, while thinking with and through the materiality of the body itself, and with each other. The DIY wearable e-textiles activity that followed the body mapping experiment contributed further to materialise this 'out of touch, out of sight' body part (the pelvic floor and its muscles), offering the women and girls, through a combination of crafting materials, tools and techniques, the time and opportunity to discuss and converse among themselves.

Conversations captured throughout these activities revealed that the five women participants in the 20-30s group workshop were generally knowledgeable about their external anatomy. However, and similarly to the Gosforth students, they were unaware of the pelvic floor and pelvic fitness, as only one of the women, who had had children, was acquainted with the exercise. In discussing knowledge of pelvic fitness, three of the four women participants in the 40-50s group workshop also related knowledge to their experience of childbirth. Exercising the pelvic floor muscles was only part of their own post-natal experience. For the most part, women had not, at the time of the workshops, heard about the pelvic floor or pelvic fitness, understand what it is and how it works, nor know the reasons why they should consider it as a body of intimate care in need of attendance throughout the lifecourse. From understanding what is normal, to what might be considered a disruption to the body, the learning of this intimate care practice appears to be delivered late in life, and in specific situations already accepting of a diagnosis (e.g. prolapse) or, as in the case of women in the workshops, after childbirth. As some women reported, the delivery of this information is brief, and not informative or explanatory, suggesting the need (and desire) to have access to facts and details about their intimate bodies.

All in all, the e- textile toolkit and the design workshop format was my first attempt in practice at exploring methods that may support women's health. In addressing the challenge of such a sensitive topic, I aimed to design a technology (set of activities) that could help

destigmatize the conversation on the intimate female body through imbuing the materials of interaction with feminine (and feminist) qualities and features e.g. visual design, craft, computational textiles. This was achieved by appropriating methods that otherwise are better know to support anthropological research or specifically computation meanwhile addressing gender, methods which, in this thesis, turn into an opportunity to enable intimate (self) care. In exploring methods that can be used to support women's health within HCI I am interested in finding creative approaches to engage communities of women in topics of health and wellbeing that may be more or less taboo or known among them, e.g. the added set of words added before the second workshop in order to make clear and easier the appropriation of biological vocabulary. Understanding what is available to different communities, in terms of individual and collective knowledge, is crucial to inform the design of caring technologies for the woman.

In the next chapter, I introduce Labella, a system designed to promote awareness of the intimate body.

Chapter 7. Labella

Ginny*: One thing that has struck me in relation to my own work is that overwhelmingly women don't seem to have a word that they like to talk about their genitals. You say you use vagina because that's the word that people understand the whole thing to be.*
Eve*: It's the only word that's agreed on in a way, and that isn't derogatory. Because if you think of any other words for the vagina, they're all degrading.*
Ginny: *Or sort of little kiddy works.*
Eve: *Which is degrading in an infantilized way.*

(Public Talk about 'Private Parts', Braun & Ensler 1999)

Figure 15: *(top)* Labella in use; *(bottom)* illustrations of use. Photo: Ko-Le Chen; Illustrations are my own

7.1 Introduction

The previous chapter consolidates the design requirements for exploring body literacy and intimate care in HCI. The eTextile toolkit delivered through a series of design workshops revealed that qualities of body knowledge can be affected by topics of taboo, misinformation, and lack of self-awareness. Anatomical terminology might be considered clinical and euphemistic terms often take their place (Braun & Kitzinger 2001), and many women are only vaguely familiar with their genital anatomy and functions (Labuski 2013). In this chapter, I discuss the deconstruction of the female body in light of these qualities. The evidence that a wearable interface supports situated learning about the intimate body, and the ways in which taboo interactions were negotiated with humour throughout the design workshops prompted the conceptual design and development of Labella. I derive from a cultural taboo, the 'vagina', as motivation to design a technology that could lessen the stigma associated with a woman's intimate body. The chapter introduces Labella, an augmented system that supports intimate bodily knowledge and pelvic fitness in women.

The aim of the study I describe in this Chapter was to explore how body-worn and digital interactions might support health and education in relation to intimate parts of the self. Through Labella, I attempted to design a technology that promotes knowledge in self-care. In addition to the self, I explored Labella within couples to enquire how knowledge, of not only the self but also the other, promotes capacity in an intimate partnership with a focus on health and wellbeing. I positioned Labella as a technology probe to draw on the open-endedness of the design and make the most of field-testing the technology (Hutchinson et al. 2003). My interest in doing this was in understanding how such sociotechnical system might be in demand and how its embodied approach to design and interaction merges knowledge, awareness, and speculation. The focus of this study therefore is to explore the opportunities afforded by and for designing technologies that might impact knowledge of the intimate body by interweaving everyday technologies, i.e. underwear, mobile phones, within the production of conversations attained through the design of interactions.

The Chapter focus on the conceptual and design-oriented approaches to the interface and that of the interaction with Labella. It includes two stages of deployment that took place between January 2015 and August 2015: the first stage included the deployment with women only, and the second stage involved deploying Labella within couples.

7.2 Situating the Approach

Labella invites the woman or partner to be an active participant in looking through an interactive surface (a mirror) to the body (the vagina). As I introduce in Chapter 1, in using "vagina" as the body part to describe the scope of the interaction between Labella and a woman's genitalia, I am referring "not to the 'medical' vagina, but rather to the "common-sense" vagina - all the bits 'down there'." (quoted in Braun & Ensler 1999). Moreover, women's demand for knowledge about their bodies and a greater control over their health and wellbeing, which prompted the feminist health movement that emerged in the United States during the late 60s (Morgen 2002), led to an expanded interest in the body. "Women in this movement located power in the mirror and in genital self-visualization, and they reclaimed both as productive tools with which to confront the male-dominated institution of gynaecological medicine" (Labuski 2008). Much or little might have changed since within women's health care, choices, and rights, e.g. abortion laws and services available and variable in different countries (Singh et al. 2009), methods of and access to contraception (Rabe & Wolf 2012), a more comprehensive sexual health education within the school curriculum (Thomas & Aggleton 2016). Nonetheless, health and care of intimate parts such as the vagina have not only seen little technological breakthrough in its (clinical) interventions, the vagina persists as an 'uncomfortable' (social, personal) topic up until this day, which in turn perpetuates a culture of shame, secrecy, and lack of awareness that can be (broadly) damaging to genital integrity.

Whilst using a handheld mirror might increase a woman's physical comfort with her genital body, women still tend to avoid contact with genitalia that don't hurt (Labuski 2013), or talking about 'private parts' if it might "put 'sex' on the agenda" and lead to improper commentary (Braun 1999). Moreover, as discussed in Chapter 2, the cultural construction of the body is fashioned within and by culture, and "the body - what we eat, how we dress, the daily rituals through which we attend to the body - is a medium of culture (Lupton 1994)". A mirror is a technology for surveillance (Twigg 2004), a tool to support control by display, and the cultural context in which women live with their reflected image highlights 'exteriority'. "'The mirror', after all, "almost always serves to reduce us to a pure exteriority. (…) We look at ourselves to please someone, rarely to interrogate the state of our body or our spirit, rarely for ourselves and in search of our own becoming. (…) [T]he mirror is a frozen – and polemical – weapon to keep as apart. (DW/SG 1993: 65)." (Irigaray quoted in (Labuski 2008)).

The primary emphasis is on the visual sense, that that the mirror provides us a means of outer representation. Alternatively, in her book This Sex which is not One (Irigaray 1985), Irigaray introduces Alice, who "exists behind the screen of representation". It is so to describe "the necessity for going through the mirror in order to free oneself from a traditional sort of representation(s)" (Irigaray 2008 pg 162). In this sense, my interest in using a mirror was in extending "genital integration beyond the visual", by designing a technology-enabled embodied interaction that engendered an "articulation between the visual and the tactile". Looking at oneself, as requested by the experience with Labella, allows for creating a deeper bodily integration i.e. 'going through the mirror' to explore external and internal organs while highlighting their bodily integration; show that these organs are integral to bodily functions that are critical to women's reproductive health and sexual wellbeing. Furthermore, I wanted Labella to relate conceptually to the women's health movement, in that women used a mirror as a technology of choice to not only highlight health rights (or lack thereof) but foremost to reclaiming control over their bodies.

In 'going through the mirror', the woman is invited to explore her body in a non-traditional way, one in which the body space merges with a sort of representation(s) on the screen (Irigaray 2008 pg 162). By doing this, I wanted to explore technology as an extension of the body, one that invites the senses of (visual and tactile) representation to operate in tandem with the physicality inherent to the interaction.

Furthermore, I wanted to find out if Labella could contribute to promote knowledge and care between couples regarding the female anatomy and pelvic fitness. HCI has a long history of research on topics of interaction between romantic partners. Largely, this body of work centres on mediated technologies that aim to promote intimacy within long-distance relationships (Neustaedter & Greenberg 2012, Kowalski et al. 2013). Research has also been conducted with geographically close dating couples (Toma & Choi 2016) showing that the use of mobile media, e.g. phone calls or texting, promote intimacy and increase associated relational wellbeing. Computer-mediated communication technologies such as video chat provide the opportunity for couples to share intimacy by bringing presence over distance (Neustaedter & Greenberg 2012), and hybrid interactions have been explored in order to create feelings of relatedness (Hassenzahl et al. 2012), to include tangible objects (Kaye & Goulding 2004) and virtual touch (O'Brien & Mueller 2006). A more tangible approach is discussed in (J. Bardzell & Bardzell 2011, Eaglin & Bardzell 2011), in which sex toys, combined with or short of digital technologies, are reviewed in connection to public health

and sexual wellness; and the Lover's Box (Thieme et al. 2011), explores a non-traditional digital artifact to engage intimate partners in reflections on their personal and emotional lives and relationship. Nonetheless, and similarly to the lack of scholarship within HCI and women's health, the design of technologies and interactions between couples that include sexual health in relation to intimate knowledge of the body continues to be mostly absent in HCI research.

With this study, I wanted to explore first, a woman's interactions with Labella; second, interactions with Labella within couples. Hence, employ Labella as an activity of inquiry to explore possible future designs to include other biological sexes (e.g. male, intersex); both an individual or shared intimate learning (and caring) experience.

7.3 Designing Labella

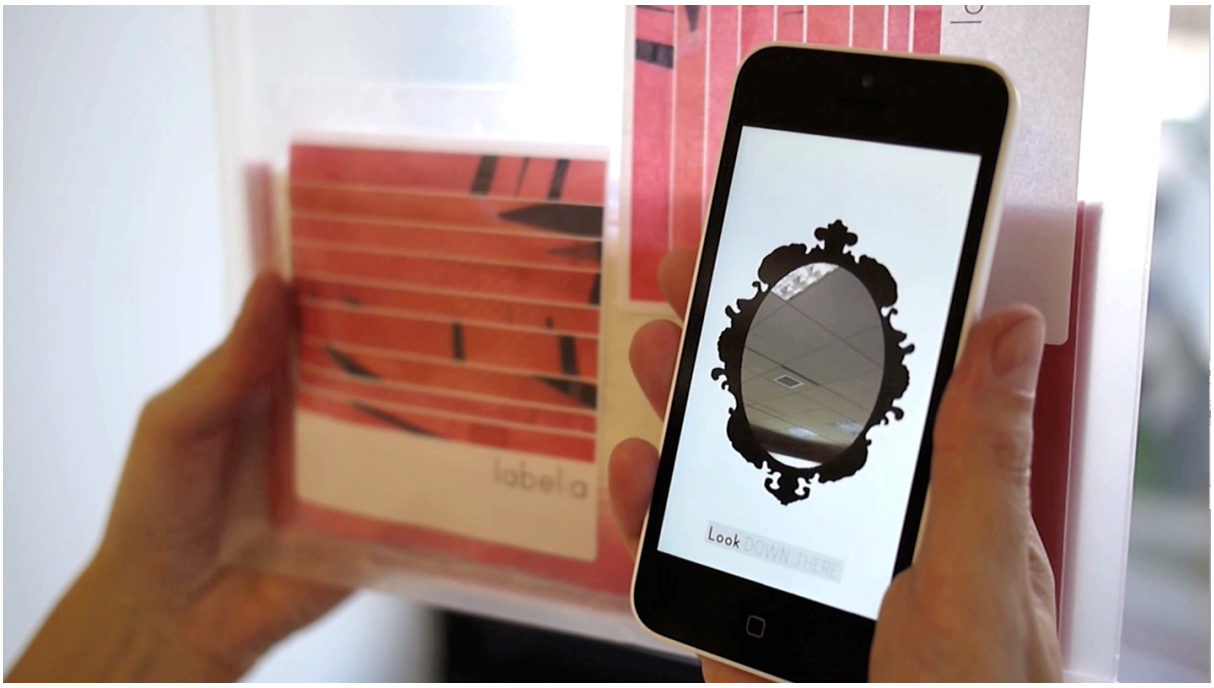


Figure 16: Materials kit with mobile phone (app). Photo: Ko-Le Chen

Materials Kit Detail

Labella comprised of a materials kit, which included a piece of customised underwear, delivered to each woman participant. The style of knickers had been chosen by each one of them and delivered to their requested size. A mobile phone with the app installed was included in the kit (figure 16), as were simple instructions, an information sheet about the project, an audio device to record thoughts post-experiment, and three note tags to write thoughts were also included (figure 17).

Figure 17: Labella: Materials kit detail (clothing tags, audio device)

7.3.1 *Components to Design*

Interaction Design

Labella combines a pair of underwear for embodied intimate interaction and a mobile phone as a tool for embodied discovery. After putting on the piece of underwear (all interactions happen with the underwear on) woman launches the app on the mobile phone, which invites her to 'look down there'. When a surface printed bespoke visual marker on the underwear is recognised by the camera phone it moves forward to a new screen. This new screen shows an augmentation of the female perineum (Figure 2 – screen 3). This reveals to woman an illustrated representation of a hidden part of her body. Initially, it gives an interactive illustrated mirrored image of her external genitalia, in the case of the prototype discussed here, by using a 3D model. A written language indicator on the screen invites her to touch and discover more about the different parts. Afterwards, it provides a visualization of the female pelvic floor and its muscle structure. A simple animation of the pelvic floor contracting and relaxing also offers a new perspective on how this muscular structure works while learning about *'the subtleties of the technique'* to exercise it. Lastly, the mobile application invites woman to exercise and the screen on the mobile phone switches into front camera mode, showing this time woman herself. She is offered ideas on what and when to incorporate this fitness exercise into daily routines, and given the opportunity to take a 'selfie' while contracting her pelvic floor muscles to emphasise the invisibility of the exercise (Figure 18-19).

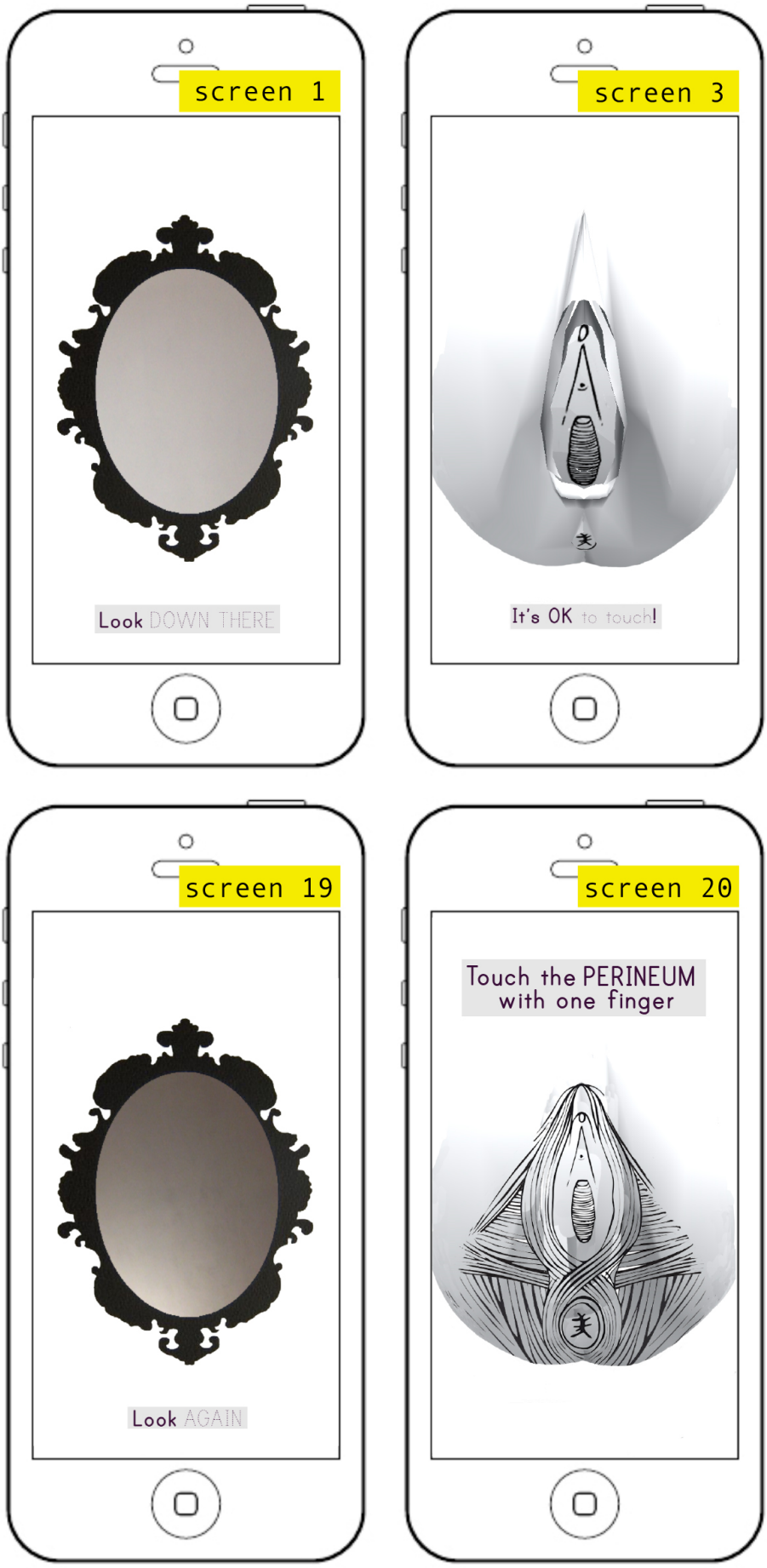


Figure 18: Labella: A selection of screen designs

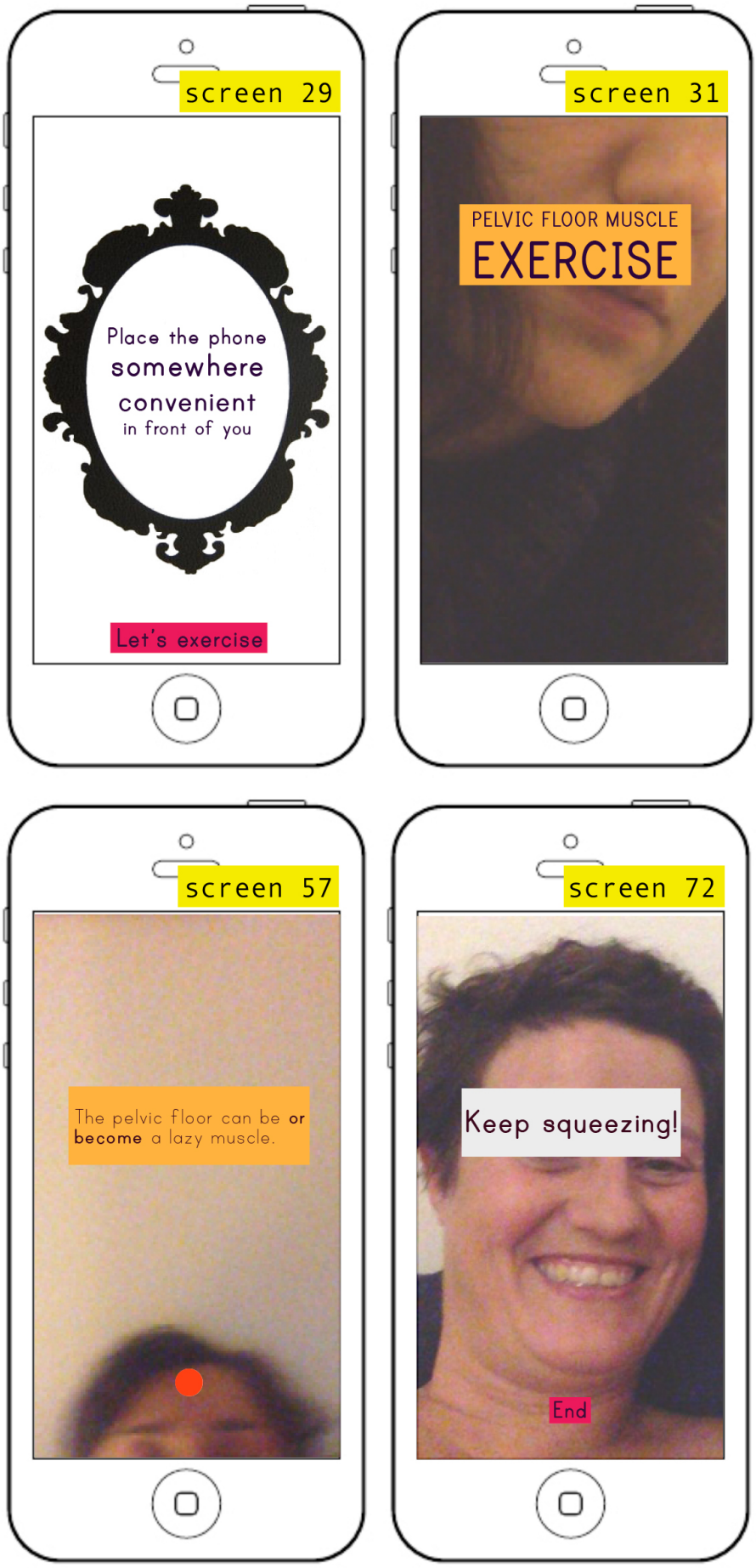


Figure 19: Labella: A selection of screen designs

Underwear Design

The iPhone mobile app connects to the female body through the recognition of bespoke printed markers (figure 20). These markers are screenprinted on textile-based specialist underwear. The location for the marker was chosen based on suggested bodily interactions with the phone, as indicated by the simple instruction on the screen, which in turn requires woman to 'explore' her piece of worn-underwear with the handheld device (similarly to the way she would explore her body with a mirror (Murphy 2010).

Figure 20: Examples of underwear (with screenprint designs and marker) used in the study

Visual Design

To design the interface I chose a freeware font called 'Print', designed by Blue Vinyl Fonts. Print is a Sans Serif available in three styles: Print Bold, Print Clearly, and Print Dashed. These three different font styles were very convenient as a visual aid to differentiate three types of data on the screen. I incorporated them with three different background colours, on a range of metallic red and copper in resemblance to the print on the underwear, and a more neutral grey as a third colour. I used the metallic red as a background for functioning touch buttons, when pressed the button the user will proceed to the next screen. The colour copper was used as background for small pieces of text that describe biological terminology whereas the neutral grey was used to introduce quotes (using a more colloquial language to refer to body parts) taken from participants in the eTextiles toolkit workshop. I used the Print Dashed font as a way to visualize text that may resemble like a whisper, as a combination of speaking very softly and sharing intimate and personal facts. I have done so in an attempt to incorporate a humoristic graphic effect, as I use humour as a method of strategic communication (Delaney 2011) throughout the design of the artefact. Common relatable identifiers between the use of humour and the interface and interaction design in Labella can be seen, as I have applied them, in some of the principles that make products humorous as

elicited by Yu & Nam in (Yu & Nam 2014). Those principles are: shape incongruity by using the method of 'breaking proportion' and magnifying a part of the body to elicit the user's amusement; unconventional use by exploring the incongruity between the expected use of the products and the actual situation of use; unexpected function by inviting users to attribute a new function to the products that they cannot anticipate from their appearance, and that will go beyond their expectation; visualization of taboo by making an aggressive use of a social taboo and destroying the norms; destructive play by stimulating the user to get involved in a playful interaction with the products, which will lead her to break social rules in the process of 'operating their functions'.

7.3.2 *Technology Probe*

The main function of this technology probe is to connect the smartphone and the wearable item in ways that the participant is prompted to use the technology to explore and discover the body in an unexpected manner. It collects audio and visual data at designated times, and its open-endedness is "a tool for challenging pre-existing ideas and influencing future design (Hutchinson et al. 2003) ". Two different instances within the interaction with the mobile phone triggered the following audio and/or visual requests:

1) An email appears on the screen after the camera phone detects the marker on the underwear and reveals the 3D model of the female perineum. This email informs the woman that the system had just recorded audio of this interaction and asks permission to send the email else to close the email:

(Email subject) **Really inner parts…**

(Body of email) Labella recorded this moment. Audio only.
This consists of a few seconds of sound, starting from the moment you have taken the phone down there to the moment you've seen the illustration of your inner parts on the screen of your phone.
This is for documentation only, and if you agree to share this audio file with the researcher please *send email*.

2) Towards the end of the interaction with the system, the woman is asked to take a picture (selfie) of herself while doing a pelvic exercise:

(Email subject) **Squeeze, release**

(Body of email) This email will send the photo you have taken previously to the researcher. Whereas the photo might be of you exercising your pelvic floor muscles, "exercising them should not show at all 'on the outside'. It is important that you should not pull in your tummy, tighten your buttocks excessively, nor hold your breath."

This is for documentation only, and if you agree to share this image file with the researcher please *send email*.

The development and implementation of Labella as a functional, technology probe, was the result of a collaboration with Dean Saraf, at the time a fellow PhD student at Open Lab, who adapted and redesigned the 3D model used within the mobile phone. The custom-made software on the iPhone platform was fully created by Gavin Wood, also a fellow PhD student at Open Lab. A more comprehensive technical description can be found here (Almeida et al. 2016), and the open source code is also available on GitHub through Gavin[4]. For the purpose of this thesis, I will leave out the description of the computational development and technical implementation of the probe.

7.3.3 *Deploying the Materials Kit*

This materials kit served as catalyst to engage the i) woman and the ii) couple, and all of its components to capture participants' experiences of Labella. Below I show how Labella can act as a device for transforming learning on the body and awkward learning as a valuable tool to talk about the 'unmentionable' (Braun 1999). As women talked, their experiences with Labella were naturally intertwined with their own personal histories. Similarly, couples' experiences with Labella were naturally intertwined with their own personal histories too. This coupling of stories and experiences is presented in the sections bellow, starting with 7.4 where I present findings from the women's first interaction with the probe and describe their solo experiences, followed by 7.5, which accounts for the interaction within couples. 7.6 presents my reflections based on these two iterations with Labella.
In accordance with the consent given by the participants pseudonyms are used throughout.

7.4 Women's Experiences of Labella

Learning about the body was not new to most of them, with some having had a formal introduction to the reproductive system as teenagers while in school, such as Sophie, Alexandra, Beatrice and Anne. Elizabeth had further studied anatomy while attending University. Participants such as Birgitte describe this previous learning as superficial and vague or, in the case of Camilla and Marie culturally constrained. Marie, however, is interested in gender and volunteers as a sex educator. Louise and Sarah are women's health physiotherapists and view knowledge about the female anatomy as fundamental. They believe everyone is familiar with the "basics". Eugenie acknowledges knowing the basics but

[4] https://github.com/thecreativeexchange/labella/blob/master/README.md

nonetheless she is confused with the terminology and has misconceptions about some of its parts and fitness. Agnes and Katharine incorporate pelvic floor exercise in their core workout of Yoga and Pilates teaching and practice. The fitness of the pelvic floor muscles as a health practice was unfamiliar for five participants, and the pelvic floor was generally unknown to most in that it creates a support for external genitalia, or pertains to preventative care and is essential for the wellbeing of women.

7.4.1 *It's My Body (You Should Know This Stuff, Right?)*

Both Louise and Sarah consider that "the majority of people know where their genitalia are", and Marie also comments that everyone should know "the basic level of education that was in the app". However, these three women have expertise in the area of women's and sexual health, which, as Louise acknowledges, might conflict with her perception of what others know. For Camilla, Labella led her to recall "words" learned in the past within the context of childbirth [i.e. pelvic floor], and to remind her to exercise [i.e. pelvic floor muscles], which she has been "lazy" to do. Asked if she had learned anything new, she comments:

"Of course! Of course, I learned a lot of new things. Actually, it makes me feel quite dumb because (laughs)… things that as a woman I should know. But I didn't know… I must confess, I didn't know…(…) I wouldn't use the word dumb, I would use the word…. Blurred might be better (laughs)." (Camilla)

In general, the technology contributed to enhance the participants' body knowledge, either by consolidating previous knowledge on their external body organs:

"It was reassuring that I knew where things were (laughs). And I can see that if I did this test when I was 18 I'd probably would have learned a lot." (Elizabeth)

Or by adding new knowledge:

"I didn't know about this, what is it again… perineum." (Camilla)
"I think I went online searching for perineum" (Kate)
"I didn't know where the clitoris was…" (Birgitte)

Although most participants have the memory of learning about the subject in school, they also refer to the fact that these were covered "briefly" and "with not so much detail".
Asked if she was familiar with all the body parts, Sophie remarks:

"No… not as much as I think I should. It was interesting to see it [Labella]… you know, I had classes about, you know. All of this, but I don't think they went that deep into it…" (Sophie)

7.4.2 *Obstructions to Constructions of the Female Body*

The lack of confidence in communicating with others and one's own bodily taboos contribute to inhibit literacy about the female anatomy. According to this study, the female body continues to be a mystery in everyday knowledge. While this mystery was well documented and researched fifteen years ago (Braun & Wilkinson 2001), and is well instituted within medical practice, it continues unresolved for the lay person. Through enquiring with Labella I collected various personal histories of misinformation and the awkwardness of learning experiences at both informal and formal circumstances.

Colloquialisms applied to the intimate parts of the body were common in the way the women talked about learning about their bodies. Most people acknowledge knowing about their bodies in that way, i.e. urethra is commonly known as the "pee hole", and generally the vulva is understood to be the vagina, hence generating further misconstructions about it. Furthermore, employing awkward metaphors to describe intimate body parts or how they function appear to be frequent not only in personal but also in professional settings. For example, Marie took ballet classes for 10 years, during which she was told to "tighten those muscles" [pelvic floor muscles]. However, she was never explained exactly what and where those muscles were, or how to correctly exercise them. She comments:

"They just said that there were some muscles that were not your butts but in some way there… like, if they had specified like where the muscles were it might have been easier to identify. And I remember for years 'taking the elevator up, and stay there', being used very often … and I was like, which elevator am I thinking of? You know, in that position you're also doing the elevator thing on all your muscles here, so I'm like, and I really didn't understand, and I was just like squeezing which is wrong, actually…" (Marie)

Labella finally helped her understanding the elevator metaphor, she notes, *"so that was really helpful, in understanding why it was a lifting idea (laughs)."*
Furthermore, both Eugenie and Birgitte assert self-awareness. However uncertainties such as being *"familiar with Kegel exercises, I just didn't realize that was for the pelvic floor"* or *"so you roughly know where… aaah, the main things are, but you wouldn't know the specific positions"* demonstrate how enacting Labella contributed to further understanding of their own bodies.

The informal learning experiences of the participants, and as a result their body literacy, were undoubtedly culturally influenced. For example, for Camilla, who at the time of the study is sixty-three years old, the awkwardness is a reflection of people's cultural background. Having

been raised embedded in a Chinese culture, she thinks back at how intimate body knowledge passed from mother to daughter, and the taboo associated with it within such utmost familial relationship:

"But even when I had menstruation my mother found it awkward to explain. So, I came back one day and then there were some marks on my uniform and my mother said come here, come here, let me look and I said why? Because there's a stain on the back of your and I said oh, I had art class maybe I sat on the paints, you know… can you imagine how awkward, they don't talk to you about it." (Camilla).

Camilla also considers that the difficulty in talking about natural body functions inhibits women's bodily experiences. Gaining agency of the body involves managing embarrassment and social-cultural constructs alike. When asked if she had had that conversation with her own daughter, she remarks *"Aaah I did, I did. I did tell my daughter when the time came."* Social learning outside of the family happened at times when there is an urgent need to care for oneself, enabling the individual to gain knowledge about body taboo topics, as noted by Sophie:

"It was a Biology kind of trip and we went to the beach and someone needed a tampon at that particular time but never used one. So it's like, where does it go? You know? And you should know, at that point we should all know, where that goes… and you know, the girl who had an older sister that told her… ok, ok so I'm going to tell you, you do this and this and that… it shouldn't hurt (laughs)." (Sophie)

In this example, this lack of control in intimate self-care revolves around a lack of timely knowledge, i.e., by the time she starts menstruating she is expected to know how to care for her natural bodily functions and should be aware of options available for maintaining her personal hygiene; and the awkwardness experienced in the practice of trying to understand one's physiology.

As I have shown, sharing of informal knowledge in a timely manner, regardless of whether the conversation is with a family member, or in the school context, can be awkward. Sophie comments on her personal experience of sex education within a mix school: *"because when I had those chats, conversations, it was always an uncomfortable moment, maybe"*. She considers that learning about the reproductive body and, more broadly, sexuality is challenged by perceptions of the self (puberty) and the willingness to confront change:

"because of the age, it's not an age you really want to look at that, because it's already embarrassing, I think, when you're hitting puberty cause it's a change and you don't want it…".

Physiological and psychological pubertal changes might present obstacles to learning within a formal structured environment. Learning is awkward for the student who is going through puberty, as much as it is awkward for the teacher. Professional and knowledgeable, the teacher should also feel comfortable when introducing such bodily matters in class:

It's not something they talk about [in school], maybe because when they talk about it, then it's this sexual thing and then when you're at that point maybe you feel uncomfortable…" (Sophie)

7.4.3 *Look Down There*

"Look Down There" is the only written language indicator on the initial screen after launching the application; the screen subtly designed to reflect the idea of a mirror. In the absence of clearly defined instructions on how to use Labella, participants began their interaction with different levels of uncertainty. In most cases, they understood the suggestion offered with the materials kit of wearing the underwear before launching the application on the phone. However, some initially failed to associate the on-body interaction to that of the digital space. For instance, Kate comments:

"So I was wearing this and then I used the app, I started the application, and it took me ages to understand what "look down there" [i.e. focus the camera of the phone on the crotch of the underwear] was (laughs). Like, it was like… look down there… my professional side, I was like, I was reading it like… then I realised it is super cool, I mean, I think that it's super funny. When I was discussing, I was sharing this (with friends), I said "look down there", it's like "look down there" in the digital world, so I was scrolling down, you know. It said look down there, look down there in the app, so I was trying to scroll down. But also, I was scrolling down forever, I didn't realize "look down there", what (laughs)." (Kate)

And Alexandra's interpretation was solely embodied in her physical reality:

"Aaaah because it wasn't quite specific the instructions, "look down there", so, I mean, it could be anywhere, right…? It's not specific… yeah. (…) So, I think it's not… common enough. I was like, I mean, "look down there", and I look down there, and I see my feet!" (Alexandra)

Moreover, some participants associated 'Look Down There' to their earlier 'awkward' formal learning experiences:

"It's something I remember, you know, talks when I was at school, and getting diagrams and actually I remember the nurse saying to you, if you get a mirror… and you look down there… but it is very, I think, awkward as well because you're like aaa [surprised caused by looking at one's own genitalia for the first time]*…"* (Agnes)

Using the mobile phone as a mirror might be a rather common practice in personal care practices both public and private, for example, putting make up on. However, using the phone as a 'mirror' in such intimate parts of the body furthers self-reflection in ways that challenge self-consciousness, bodily taboos, or the physical indignity of looking at oneself. Marie remarks:

"It made me kind of giggly, at first. You know how people say oh, take a mirror and look at yourself, and you're always told to do that, get to know your parts, and get comfortable with yourself. So, I strongly believe in that. In getting to know your own body. But I found the actual process of putting a mirror between my legs like a bit awkward and I always felt a bit stupid like, like… also because it's very strange to see your external genitalia reflected at a distance from the rest of your body, right? Which is what is happening when you're looking at the mirror… yeah. But this one, because it was like legitimate and I had to get to that awkward position, in order to move on in the app, it made me feel like aaah, I could get used to it. I could get used to holding a mirror in an awkward position (laughs)." (Marie)

Unsurprisingly, the combination of a piece of intimate apparel and a smartphone is the catalyst for reflection on body taboos and the necessary awkwardness of looking at oneself. Overall, only two participants reported to have had difficulties finding "an easy position to get into". By "getting into funny positions", or putting oneself "in positions that are "very strange", the majority engaged with the technology. Ultimately, this is the interaction involved in starting the experience with the app, which progresses to untangle the 'mystery of the female body' through a process of trial and error and exploration.

7.4.4 *Trial and Error*

Finding the 'right' position to successfully enact this interaction involves probing the boundaries of weird and that of the interface. Putting oneself in "positions that aren't really glamorous" is necessary for managing some bodily functions, such as menstruation. Products to manage this require different levels of body knowledge and comfort and, similarly to pointing the camera phone on the crotch to ignite the digital interaction, imply some trial and error, and comfort in exploring the body in this way. Marie compares her experience with Labella to that of her own intimate care experience:

"And I was just like 'why isn't it working, why is it…'[no response from the interaction], tapping it [the screen on the phone]. I mean, I also use a menstrual cup. So this is like weird positions, I think I had to trial and error as well, so it was all familiar to me, like what… in which position does it go in the easiest." (Marie)

Moreover, the interaction – the looking down there, and needing to find the right spot - made Marie feel "kind of giggly", and Alexandra recalls "smiling" to herself. Camilla also considered it initially "strange" and afterwards "cool" and "fun". She remarks:

"I could not imagine peeking myself down there, but anyway, you made it in such a way that it was fun, you know! And aaah, you made me recall a lot of words, like I said the pelvic floor and then you made me be aware to touch those parts and remind me, you know, where they are because to start with you don't normally peek down below, it was a… it was a fun way of 'examining' myself, if I may say so." (Camilla)

Comparable to the awkwardness of the nurse, who comes in to school and recommends Agnes to get a mirror and look down there, therefore making it an allowable interaction conveyed within a formal learning environment, Labella too is acceptable for Marie, regarding it is positioned within a research study. Further, she welcomes this strangeness of distance and disembodiment, as she positions awkward as necessary for self-learning.

7.4.5 *Learning through Externalizing the Body*

Labella is introduced as an interactive artefact and as another 'language' to talk about the body:

"it is more interactive, it is a more interactive way of learning and it's very approachable and it's not really patronizing" (Marie)

For Marie, this interactivity is empowering. When asked about different approaches to talking about bodies in the sex Ed workshops she conducts, she comments:

"Yeah, I find it helpful when people are laughing and go uh, what's that? Or like, if it's a part that is not specific to any person and, yeah… it just helps with look, look how funny it looks, the body is really funny also kind of weird, right (laughs). I think we look really weird." (Marie)

Moreover, Sophie compares Labella to learning in school. Usually, this body knowledge is delivered at a time when "the body is changing" (puberty) and which might make people "uncomfortable". She feels that Labella has introduced a new approach to learning with and through design:

"It's not a picture, but it's the graphic way. But it looks scientific in a way. You know, it doesn't look like anything else... I mean, it gives you another language of the thing. It is another language you're using for the same subject. It's how you present it." (Sophie)

Visualizing the body as external to the self and held within a digital space grants the participant a new reality embedded in the technological artefact. At the same time, embodying interactivity explores the interchange between the body and the phone, for example, when prompted to touch [textual indicator on the screen that accompanies the illustration of the female perineum], some participants were unclear on whether to touch on screen or their own bodies. Agnes remarks:

"And when it showed you, it said touch here or something. I didn't know whether to touch on the phone, touch the bit on the phone, if it actually meant touching it on the phone or touch me (laughs)." (Agnes)

Interpreting this action led to uncertainty, since "*we don't often do that*". Seeing the illustration on the screen, which once 'touched' translated into movement [animation] the pelvic floor [contraction/relaxation], was a novel approach to learning within the intimacy of the screen. Nevertheless, Labella gives participants something that they had "*never been able to visualize*", now giving them something "to imagine" when doing pelvic floor muscle exercises. Initially prompted by interaction on the body, through the wearable, it supported participants to perceive that particular body space more accurately:

"Yeah… I thought it was like the back of my hips (laughs)."(Eugenie)
"I thought they were a floor, right. But then I didn't understand where the floor was (laughs) so I thought maybe it was just like, like a plain of muscles, I don't know (laughs)." (Marie)

As a result of using Labella, Marie *"learned that it's called the pelvic floor… that that is where the pelvic floor is",* and Eugenie reviewed her understandings of pelvic floor muscle exercises: "*I've never thought it looks like that [pelvic floor], like a 'sphere' so that was really interesting to see it contract like that. And yeah, yeah, yeah that was cool. And now when I do Kegel exercises I imagine that 'sphere of muscle'."* A distinct quality of this exercise is that if done correctly no one should notice it. This was a quality that many participants found 'interesting' and 'empowering'. Kate remarks:

"And then I realised that I was doing it correctly and it was super fun. The fact that people… you could do this, but people should not understand that you're doing this, it's actually kind of powerful! Powerful… because then I did it in my office, I did it in the office!" (Kate)

The intangible quality of the exercise to be invisible to others strengthens the possibility of incorporating it into everyday reality and the understanding of how it is performed gives oneself the confidence to do so. In contrast, being asked to memorialize the experience of exercising the pelvic floor as a visual token [digital photograph] had a negative impact on some of the participants. Although Labella queries a photo as evidence of workout to underline the fact that a distinct invisibility of this [pelvic muscle] exercise, some of the participants thought Labella was requesting something quite different. While Alexandra "didn't think much about it", Sarah considers that "taking pictures and things like that" is "crossing that barrier of intimacy". Marie agrees that she generally feels OK with talking about her intimate body, however she would hesitate before considering taking a photograph of its parts. She comments:

"I would feel kind of strange, not really so much to do with privacy as just general aaah, embarrassment, perhaps. Like, it's a weird kind of photo to have (laughs). Or to give!" (Marie)

The purpose of this photograph might have been unclear to some in part due to its expected mirroring component. Nonetheless, Birgitte wondered about its role in her personal, intimate experience. This experience with Labella made her look and she would like to know more:
"I'm just thinking whether people should be wearing underwear or not, when they are doing this. I mean, it's something very personal… to just take a picture of your vagina. Then you have, let's say… the picture that you have is like a drawing, but I'd have your own picture so you can compare where things are. Yeah! I personally, if I'm doing it by myself I don't mind the to have my own … yeah, so I would know…" (Birgitte)

7.4.6 *Same, Same, but Different*

Curiosity through the body can be beneficial toward learning, and where similarities and differences between women's bodies are visible they also share common features. For Camilla (and in contrast to Birgitte's earlier comment), enacting Labella would have created discomfort if it had required her to expose her naked body [the physical indignity of looking at oneself], as she feels self-conscious of her surgical cuts, or having someone else looking [judging]. While this made her feel vulnerable, she was determined to partake in the study. Labella was a valuable experience that emphasized both the normal and the unique. She remarks:

"(…) it's not such a taboo subject after all, and I'm among women, I always say what you have I have, rather it's bigger or smaller you know (laughs)." (Camilla).

Whereas Sarah comments that hers "looks nothing like that" of Labella's [illustration of the female perineum], Camilla notes that Labella made her aware to "sometimes have a peek" [with a mirror]. By making her look, and however awkward this self-reflection might be, the confidence to do it is newly achieved to Camilla:

"Since it happened hey, it's not so bad sometimes you can have a peek! I mean, otherwise it would never occur to me in my mind… to have a peek!" (Camilla)

By 'giving permission to look' in weirdness, and having provoked a wide range of reactions from 'fun' to 'awful', Labella compels looking anyway through exploring this technology that is personal (the medium and the data) and by reinforcing a non-traditional body interaction. Nonetheless, it suggests a distinctive tone of learning and interaction conducive to intimacy with the self.

7.4.7 *Strange, But Fun*

The role of the intimate wearable is critical to enable situated learning about intimate parts of the body through exploring the physicality of the interaction. Awkward learning, as discussed previously, combines 'weird funny' and 'weird not funny', challenging weirdness as prohibitive although helpful in breaking awkwardness. Avoiding problematic knowledge or feeling self-conscious contributes to inhibit discussion. Moreover, laughter makes the conversation more accessible and puts people at ease therefore contributing to the social component of the interaction required to talk about bodies that are '*funny*' and look '*kind of weird'*. Alexandra relates how amusing situations and humorous products can contribute to get the message across:

"Yeah, it's like in general I think humour always helps in delivering a message, you know, it breaks the ice, it makes people remember the message… or if they don't remember the message they remember they laughed and they found it funny. And then, even if they don't remember the exact details they remember roughly what the gist of it was. So, just… making an impression." (Alexandra)

Making an impression can help delivering the message, as one participant notes about her experience:

"You know, it's not the kind of experience [Labella] you're going to forget for a while (laughs). Because it's a bit strange but fun at the same time, and I think that definitely helps more than seeing a picture or a model."(Elizabeth)

Humour also makes such bodily topics easier to share, and works well as a conversation starter:

"I think it will be good, it's humorous, right? So you can start sharing with your friends. Talking to my girl friend about oh, this app, I just learned that… sort of teaches you where, how the vagina works. Yeah, that would be interesting! Instead of, let's talk about it, right." (Birgitte)

Birgitte thinks "*people want to know more about this*", and talking about the vagina is something that can be amusing between female friends. Camilla relates how the humour in Labella can support conversations:

"Because this topic is rather sensitive, you know, and you… because it's very sensitive by creating a bit of humour, and fun, then people how should I say, they open up because it's not such a taboo subject after all)." (Camilla)

In contrast to what well women in the study might suggest, and from a health care professional point of view, Sarah points out that her patients, when coming in into her women's health physiotherapy consultation, they are already *"really having a problematic time and they are looking towards information (…) they just want the facts"*. Nonetheless, she appreciates that humour can be a tool for engagement with such sensitive topics. She comments:

"There's a comedian called Gussie Gripps, she's on Twitter; a physiotherapist called Elaine Miller, she talks about stress incontinence. And she definitely uses humour, she actually doesn't have any women's health experience herself. She takes care of the elderly so she just recounts what her experience is of having leakage… She's been asked to talk in Australia, things like conferences, despite the fact that she's not an expert in the field, so obviously humour is well received in the area… Mmm, also there's an Australian called Sue Croft, and she has a little rubber chicken (laughs) it's about this big (shows size, about 25, 30cm tall) and you squeeze its belly it like lays an egg but perfect for describing how prolapse occurs for women. So, use of visual things to make people… and I think with my patients I would use appropriate humour, at the appropriate time… Obviously it's important you got to be, you got to be knowledgeable, so there's no harm on breaking down barriers through humour." (Sarah)

Engaging appropriate humour at the appropriate time is crucial for Sarah, while eventually demedicalised artefacts are suitable to support learning if proper in the circumstances. That might not happen within a consultation however, where women are patient bodies looking for restorative care or rehabilitation.

7.5 Labella Within Couples

Marina and George have been married for two years. They are interested in holistic healing and exercise the practice of complementary therapies. Both were aware of the pelvic floor, as

contracting its muscles is integral to some meditation and yoga practices, understood to have an effect of restraining energy at the perineum, to *"close the circuit of energy"*. Marina has a teenage daughter from a previous relationship and also had learned about pelvic muscle exercises while still pregnant. Similarly, Alice had heard about pelvic exercise while pregnant of her first child. Whilst she had been informed about it, she was unclear on how to practice it. She is married to Philip and they have two children. She thinks she can understand it better now, as after the second delivery she was more aware of her body and what was involved in the maintenance of her pelvic health. Moreover, Philip was aware of pelvic exercises for men, just as was Andrew. Andrew and Annabel are married and have moved as a couple to the UK shortly after their marriage. Whilst their socio-cultural background might hint at a conservative upbringing and lifestyle, in accordance with the Middle Eastern country they originate from, they have had a liberal education, are secular Muslims, and generally hold progressive points of view regarding politics, culture, or care. Moreover, they were acquainted with my research before this study. Likewise, Eva had heard about it before, and I had shown it to her a few months earlier, after finishing the study with women. She is twenty-one years old and was on a three-months relationship with her boyfriend Henry at the time of this study. Kate was no stranger to my research either, and she too was familiar with most concepts. She had been recently married to William at the time.

7.5.1 *On Experiencing Together*

Eva was quite certain that she would manage to get her boyfriend to join in. However, she would later email me about the fact that her boyfriend had concerns regarding the study and his privacy in particular, in the sense that his opinions "on things" would be disseminated through research and that he had no guarantee concerning data anonymization. She was not able to guarantee her boyfriend's participation anymore, it appeared. Nonetheless we had agreed that she could carry on the experience either way. In the end, he didn't participate. *"I'm not sure he was just a bit scared"*, she commented. She recognizes that she might not have been able to explain what the study involved, although she had given him the information sheet that details the required engagement. *"I don't know whether he thought he would have to, like, name all the parts or something which might have led to some embarrassment or something like that (laughs). So, I don't, I'm not… obviously, he hasn't told me that, it's just my suspicion."* Regardless of her boyfriend's refusal to take part, Eva decided to carry on the experience with Labella on her own.

Experiencing solo was also the circumstance Alice found herself in when trying Labella. Professional engagements and home life obligations with the children, shared between her and husband Philip, were holding up the experience. After a couple of weeks, Alice did not want to

postpone doing it any longer. She considered the experience as something that she could perform on her own. Somewhat it did not require both parties to participate in, in this specific case it was an option, she commented. She decided to take it on herself to do it, so that afterwards they would have a conversation with each other.

Philip ended up not seeing the app, since the app was already closed: as it only is interactive on the screen after the interaction on the underwear, for which he was not present when Alice enacted it, he did not manage to access the application on his own. Nevertheless, when they got together to talk about Labella they did *google* images of both the female and male perineum as they discussed. It was surprising to see how complex the pelvic floor is, Philip remarks. In this conversation, Alice also learned that Philip had been doing pelvic exercises himself, which she had not been aware of before. Philip commented that pelvic exercise for men is something he has been aware for a long time: *"because, I guess principally through, because it has an effect in your sex life as well, and your ability to… not come immediately, I think. That's probably why I started doing them"*. Similarly, Andrew acknowledged knowing about it. In his conversation with Annabel, she says, he had told her that *"it's not strange to me"*. He said that, back home, they have a course while in the University regarding *"that sort of things"*. Exercise was something that a teacher had mentioned in class and he had decided to research further:

"I don't know if it's the same muscle or not, but it's actually a treatment for men as well for premature ejaculation, as far as I know. Yeah. So this is, I don't know, if pelvic exercises which was named after … offered or suggested that and in order to cure premature ejaculation so… I assume it's the same muscles and the same set of exercises. Ok, I just wanted to double-check (laughs)". (Andrew)

7.5.2 *In Health and On Benefits*

Whilst Andrew and Philip were aware of the significance of male pelvic floor exercises for sexual interactions or ejaculatory disorders, other aspects of pelvic floor health were not known to them (e.g. incontinence). Most recently, Philip had been concerned that he *"was going for a wee to often"* during the night. He mentions his father, and how he *"has got a dodgy prostate and had to see a doctor"*. Prostate problems can affect urination and sexual function and are conditions commonly associated with ageing (NHS 2016), the reasoning behind Philip's belief that *"as you get older it's something to consider as well"*.

Moreover, Alice emphasizes the importance of pelvic health as key to her everyday wellbeing. After having had two vaginal deliveries she feels that her pelvic floor is weaker, and she leaks sometimes (she presents mild symptoms of stress incontinence). She comments:

"But I think it's more motivating [incontinence prevention], at least for me, because it's something that will change in fact my life… OK, I mean, even if better sex life is important but it's less scary than…" (Alice)

The relationship between pelvic health and the reality of incontinence is tangible and well-defined, whereas its relationship with sex is based on 'quality': *"No, because I mean for sexual life it could be about enhancement, you know, a matter of degree better. While, you know, in terms of health…"*

On having Labella experienced within a couple, I wanted to inquire into the affordances of designing for intimate knowledge within an intimate relationship. This aimed to highlight the interaction rather than classifying knowledge. Whether knowing or not knowing all the body parts, Labella was set for exploration and raising awareness.

One advantage of experiencing together was that of having the opportunity to talk to each other about topics that otherwise might not be so exposed. Marina and George remark:

"For starters, we knew all the terms, it's fun to do it as a couple because we're talking, about this while at it, in this case I was the one reading on the screen. I think it's more like something fun to understand… not so much to understand but to see, I think that was it." (Marina)

While Labella has been designed primarily for women, any with female anatomy, engaging with such system can be instrumental across sexes and genders. Bodily knowledge can be mutually beneficial:

" …as a sort of social thing, if you… give information to both genders it's gonna work out better because… the society tend to give the information about women to women. Right? It's the trend, it's the way that it works, like for… workshops for women, I don't know, conferences for women, different social activities for women but at the end of the day women are living with men, and maybe… I talk with Andrew, more than I talk with anybody else, so if he's available, anything… like regarding, I don't know, feminine stuff it's gonna be even more sort of, I don't know… quicker for me to pick up that information (laughs). (Anabel)

Just as is understanding the mutual benefits of pelvic fitness:

"Mmm, for men? Mmm, for men certainly. Yeah, yeah, absolutely. Actually as couples, because you know, if the other person is doing it then it's mutually beneficial, right." (Philip)

Moreover, sharing bodily knowledge and practices can be heightened by such a shared experience as in Labella:

"Also the fact that it's done as a couple implies that the man also participates more… in the exercise. That's the take away message (laughs)" (Marina)
"Yes, I thought it was amusing that it was a couple's thing… it makes you talk about it, and there's that sharing of the topic… a lot of times there isn't." (George)

7.5.3 Caring is Two Ways

Caring about the relationship is mentioned early on in my conversation with Andrew and Annabel. She remarks:

"… we also care about our relationship. So we read books together, we really care, and work on it, and we suggest each other to read about things that we don't know, like, if I don't know something about men, if he doesn't know something about women (laughs). So we explain, we give each other ideas, like, I don't know books, articles, web pages, and that." (Annabel)

The fact that they learned mostly about their own biological sexed bodies, not that of the other, while in school (Middle East), may have left them withdrawn from *the other* while growing up, however it now grants them, as a married couple, with the opportunity to continue to learning together.

Moreover, Alice mentions that the vulva was something that both of them, Philip and her, were not completely aware of. They had heard about it before but were confused whether it was another term for labia. In general, they also consider that this part of the anatomy should not be a complete mystery, as most of us (in the West) surely learn about it in school:

"Also, basic anatomy is something you study really early, in primary school…" (Alice)
"I'm pretty sure I was told in school. I'm pretty sure I was shown a picture of a vagina and told what is what…" (Philip)

A certain lack of certainty however remains, as noted:

" *I couldn't figure exactly where the urethra… it's the bit I've been less involved with (laughs)."* (Philip)

More generally, Marina mentions the fact that in most of her yoga classes the instructor always ends up explaining where the pelvic floor is. There is always a newbie in class, she

comments, and in general s/he is not aware of that part of the anatomy. So when the exercise involves 'contracting the pelvic floor muscles', the instructor invariably goes through describing what to do. All the other body parts, she remarks, people more or less know about, they are not necessarily unheard of, unlike the pelvic floor. In using Labella, both Marina and George commented on the fact that, as Marina was the one reading it out loud (information on the screen), it was a fun activity to not just understand – they were familiar with all terms - but actually to see while talking about it. Moreover, Kate mentions liking having *"a mirror, it's design… that's nice"*, which might have compelled her to do the experience several times, only one when William was present. He wonders about the outreach of Labella, and using a combination of readily available technologies that might facilitate engagement with the other:

"Would there be a webpage or anything that goes along? Just because, I guess, it's sort of, it's like you know it's because it is this learning exercise… a lot of the information like mapping the names and stuff could be also on a web… the same graphics and things linked to the app." (William)

Alice ends up our conversation by reflecting on the mirror (screen 1). She highlights that the design of such experience and more so that of the interface can indeed be a personal one:

"I think it's interesting, in the beginning there's a mirror and you see your face, and then you go down, it sort of relates to your identity, and yourself, to that part, through the mirror." (Alice)

7.6 On Looking at the Vagina through Labella

7.6.1 *On Looking*

HCI research has recognized the intimate body and women's health more broadly as areas that are important, yet avoided designing for (S. Bardzell & Bardzell 2011, Eaglin & Bardzell 2011, Kannabiran et al. 2011). With Labella, I attempt to bring these topics forward and explore how digital technologies can be harnessed in support of managing embarrassment and sexuality in self-care and care of others in these intimate spaces (Meerabeau 1999).

Labella asks participants to look at their own body, and the body of other, in an unusual way. Looking can be awkward and the data suggest evidence of this through the accounts of, mostly, women participants. Whether it is looking at oneself or envisioning oneself through the look of others, the vulnerability associated with exposing the body may cause embarrassment and apprehension. While looking away might contribute to prevent

discomfort, looking back with Labella encourages accepting awkward as inevitable enabling the construction of self-knowledge.

Women participants gained insights into their bodies and, as suggested by the data, Labella helped them not only in understanding the "basics" (external genitalia) but also to nourish their knowledge of pelvic anatomy and experience of fitness exercise. Within couples, the data is less indicative of the extent of such learning. In general, the male partner was significantly less outspoken when compared to the woman, and the way she would express herself while referring to her body. Certainly, some were more vocal, such as Philip or Andrew, who assert to having knowledge of the "basics" and knowing about fitness, as an exercise that may benefit men too. A woman's anatomy is more commonly know if related to sexual functions, less so in health, e.g. incontinence.

Moreover, the physicality of the interaction in Labella introduces an alternative way to observe and materialize the body, by requesting women participants to wear a piece of intimate apparel that supports embodied perception and encourages situated learning. In doing this, the embodied experience extends to the digital screen, which offers a personal experience of non-specific individual anatomy, somewhat mimicking the experience of having one's anatomy reflected back (similarly to a mirror). While probing this system within couples, the piece of underwear still addressed the woman and a woman's biology, as intended to. However, this unilateral use, as stipulated by social conventions, opened up questions to men, as to whether having a designated piece of underwear of their own would have made them engage further in the interaction as, in the current probe it only requires the woman to do so.

Labella shares much with the traditional resources of 3D anatomical models or images in supporting women to learn about their bodies. I.e. these visual and even tangible replicas are representative of the specificities of one's anatomy but, and similarly to Labella, they are non-specific to the individual. However, in using these traditional resources, the learning takes place through establishing relationships between what is observed and represented outside the body, with what is experienced in relation to one's own body. Such a mechanism for learning can prove problematic as these models and images can seem only remotely connected to the realities of the female anatomy. Contrarily, Labella connects this interaction more intimately to the body through its invitation to explore the body by looking through the body, thereby making interacting with it seem more likely and familiar (Braun 1999).

I suggest therefore that Labella empowers 'looking', through situated embodied perception (Svanaes 2013), which is magnified by integrating the on-body underwear and by holding to the body's ability to expanse in a sensorial way through the mobile application. As such, through Labella, participants were able to explore perceptions of their bodies and look (in an interactive way) at a naturally 'hidden' part of the woman's body that is not only physically concealed but also concealed from body knowing. The participative status (Dourish 2001) required by the system allows women to investigate their bodies in ways they had not contemplated before or considered a 'weird' prohibitive effort. By presenting self-discovery of such bodily taboos through a combination of body-worn and mobile interactions, Labella allows women to situate the learning on their bodies as they see suitable for them. Embodying the technology advances the experience with the app, which contributes guidelines and suggestions regarding pelvic wellbeing and fitness. Furthermore, this interaction, which manifests not only in the digital interface but also in one's physical reality, encourages it as a tool for managing awkwardness and as a method to support memorable learning on the body.

7.6.2 *Awkward Learning for the Women*

While women participants had varying knowledge of their bodies prior to the study and in response to the variety of perspectives and affirmed knowledge held by each of them, they each engaged with Labella as a process of revealing self-discovery. I frame this discovery as a process of 'awkward learning', which intertwines the physical and experiential interaction with Labella into the embodied learning of the self. In doing so, I reflect the delicate management of privacy and dignity (Meerabeau 1999) in the learning of many topics essential for women's health and wellbeing. I found evidence of this hesitancy and awkwardness, not only in the data, but also in my experiences recruiting women to participate in the study, where to my knowledge, the 'awkwardness' of the experience kept three women from taking part.

I contend that *making oneself comfortable* is the first step to engaging in learning about this body space, and argue that the humour and strangeness entwined in the design of Labella offered a mechanism through which comfort was offered. The fact that the research kit includes a piece of underwear is 'funny' but bizarre, and in addition having to handle the mobile phone close to the worn underwear makes it 'strange'. By presenting the participant with an interaction that starts by asking her to look at her body in such a strange way helps break 'the first barrier of taboo', while offering a fun way to examine oneself. Some of the participants noted that it was this sense of fun and strangeness that in the first instance

motivated the 'peeking', but through having peeked once through Labella, participants maintained they would now peek again.

A small body of existing literature promotes humorous interactions and design in an attempt to help break social awkwardness (Wilde 2012, Wilde 2014). I note also that the expression of humour in health care interactions is a mechanism for managing awkwardness (Meerabeau 1999), since it provides relaxation and physical ease (Branney et al. 2014, McCreaddie & Payne 2011). Similarly, the giggly and funny experience of interacting with Labella provides both psychological and physical ease to look at and understand the self, sometimes for the first time. In addition, the technology provides a (physical and digital) space in which looking at oneself is acceptable (the app suggests so) and legitimate (research). Moreover, women's accounts of the body being "weird" or "funny" seek to strengthen the notion that humorous interactions within the body can be advantageous to encourage conversations and breaking taboos. In this regard, interactions that incorporates humour in design has the possibility to support awkward learning, which may be charged with not only physical or social but also emotional stigma and taboo. More so, I find evidence that this awkward, funny interaction which involves physicality and the social emotive taboo results in an affective experience (Svanaes 2013), that may contribute to *making an impression* and a memorable learning experience.

7.6.3 *Self and the Other*

While Labella was originally designed for women, I speculated the possibility for it to be adapted for and adopted by couples. Can designing technologies that talk to women and engage us in becoming more literate about our intimate bodies also contribute towards our intimate relationships, and knowledge of other? From hypothesizing that a partner is embarrassed of putting himself through the experience as it might challenge his knowledge, to conjectures on biology and gender matters, sociocultural-technical systems such as Labella offer the woman (and/or man) the capacity to engage in her bodily health. While looking or finding awkward was much less of a concern with couples, sexual health was more prominent as a topic as was incontinence for both sexes, since some of the men that took part in the study mentioned premature ejaculation or prostate concerns. Other than the compromising act of looking, or the weirdness of even considering it and then doing it, as it happened in the study that involved women only, Labella within couples started a renewed conversation on caring as knowledge and intimacy with a partner. It gave evidence that, interactions as such, can either be considered as 'fun' by both parties or embarrassing to the point of avoidance by

the man. Moreover, a disclosed interest in knowing more about his own sexed body, on its own or in relation to that of a woman's biological body, manifests the necessity to involve both women and men (biologically speaking) in literacy of one and the other.

7.7 Summary: Labella

Technologies for intimate health and wellbeing often aim to remind and motivate the user to take action to improve their own fitness. But, what if the user doesn't know enough about their own anatomy to know that they could be healthier or fitter? In designing and deploying Labella I have identified opportunities for embodied interactions to enable and support body literacy, with the ultimate aim of empowering wellbeing through enhanced self-knowledge or knowledge of other. Findings show that Labella contributed to engaging women in gaining insights into their own bodies, and intrigued their partners to the extent of desiring to know more about their (male) bodies too. With this study, I showed how, while awkwardness is entangled with self-knowing of intimate parts of the anatomy, harnessing such awkwardness can lead to funny and strange experiences that help to ease the burden of taboo. Moreover, it contributes to making an impression, of an underexplored topic that traverses biology, gender, and health, by exploring communication and reflective (self-) awareness.

Labella is a design-led intervention that explores interaction design and the aesthetics of prototyping as catalysts for dialogue around sensitive topics. Conceptually, this work is informed by multiple philosophical perspectives, including feminist theory and science and technology studies, to position women and their bodies within society. It is inspired by humanistic HCI [4], pioneered by Bardzell & Bardzell, and the quest for designing human-technology relationships with a humanistic approach that encourage an openness to novel ways of thinking that can support research in sensitive topics and challenge lines of inquiry that are absent or even 'forbidden'. Its aim was to promote critical thinking in practice-based research to develop new understandings that will inform social innovation in tools and techniques for future health. In addressing this challenge - of designing for women's health and technologies that can enable care of the self and the other – I unravel the many opportunities afforded by a woman-centered approach to design, crucial to designing with care in the context of women's health but also as an inclusive approach for ensuring that the potential for social innovation is realised and delivered.

In the next chapter, I explore opportunities to doing woman-centered design within HCI, and how these have the potential to contribute to constructs of intimate care and women's experiences in health.

Chapter 8. Woman-Centered Design

8.1 Introduction

In this final chapter, I revisit the research aims and questions outlined in Chapter 1, and how these questions evolved throughout the thesis. I do so by discussing the findings and design implications of this work for designing technologies for intimate care in women. I argue that intimate care is an area central to an individual's health and wellbeing and an area that could both benefit and be benefited by an HCI perspective. Most significantly, I argue that women's health has not been fully recognized in HCI research and design and inquire the reasoning behind the fact, plus put forward my own practice research and design of interventions that have contributed to ignite the conversation within the field. The research was motivated by the following two aims:

• To generate and build on methodological approaches within HCI that focus on health and wellbeing, particularly in designing technologies for intimate care in women's health.

• To shape an agenda for intimate care in women's health within HCI by advancing a woman-centered approach and design practice.

In looking to address these aims, I started by asking the following questions:

• *How is women's health understood in HCI and what impact does that have in the design of technology and interventions?*
• *What approaches can be used to support women's health within HCI and inform the design of caring technologies for women?*
• *What are the challenges and opportunities of designing for women's health and how can these technologies enable care of the self and the other?*

I started answering these questions early on during the research and as I progressed towards a design-led and interventional research – conceptualised in Chapter 3, expanded in Chapter 5, and applied in practice in Chapters 6 and 7 – I continued through enquiring *a woman-centered approach as a novel methodology to design that supports and enables care in women*. While doing this, I also provide considerations for research and possible areas of intervention that future researchers in HCI Design and/or Interaction Design might wish to contemplate when

inquiring about methods, approaches, or design interactions on, in, and within the body, women's health, and care.

8.2 Understandings of Women's Health in HCI

Designing for women's health remains an underexplored area of HCI, particularly outside informational systems for maternal health. In answering the first question as to *how is women's health understood in HCI and what impact does that have in the design of technology and interventions*, I presented the literature in Chapter 2, relating to self-tracking cultures, as referred to by (Lupton 2014b), which dominate much of the landscape when entangling the body and technology, selfhood and care of the self. Such approaches, I argued, do not fully account for the body (woman), in its single, discrete geography, and embodied experience.

Furthermore, HCI's main focus to date, specifically in relation to women's health, continues to be that of maternal health care, whether within self-tracking and on-body monitoring practices when in direct relationship to the baby, or record management across pregnancy if in connection to the clinic or doctor. A woman's experience of the (pregnant) body is in fact circumvented in that these technologies address the body (woman) in its utmost productive dimension and associated discipline. Hence, technologies that reflect on women's bodies through the lens of (subjective) experience remain underrepresented within the field.

Given this focus on the health of women mainly during pregnancy, HCI has to date avoided taking account of the personal and intimate experiences of the body (woman), as much as in taking charge of the 'dirty work', in the context of digital technology and technological interactions. Such avoidance has given me the opening to start inquiring into the reasons why it might be so: Is it that a woman's body is seen as a taboo to work on, in, and within, or to talk about and look at? Are institutionally bound technologies and devices adopted within clinical care the pinnacle in sociotechnical systems? Should the greater number of people involved in these transactions – adoption and design of devices, established practices, access to information – be solely industry-related, profession-based, and business-oriented, or on the contrary, should women and everyone involved as a potential body patient have a voice in what and how to handle their own care? Furthermore, what can I, and future researchers, accomplish through critical thought and scholarship, when designing technologies and interactions within this space? Is it my responsibility as a designer to bring to light topics of

research that are not receiving proper attention, and or as a woman, when choosing my topic of work?

To this end, I offered a comprehensive definition of intimate care within women's health, which I see as a starting point, one that invites more research and debate on the topic. As an agenda for change, as proposed in Chapter 2, HCI and intimate care can positively impact the development of caring technologies for women, inasmuch as promoting literacy in health and wellbeing whether in relation to self-care or care of other. While my derivative questions above may need more time to produce answers, I regard this work as a working statement of what women's health in HCI will be in the future.

8.3 Doing Woman-Centered Design

In this section, I respond to the second research question that explored a range of approaches to start conversations around intimate care in women. In asking *what approaches can be used to support women's health within HCI and inform the design of caring technologies for women*, I discuss the different approaches undertaken throughout the process of completing this thesis, and I do so in relation to my engagement as an observer within a clinical practice, and the design of toolkits and probes/prototypes.

As I discussed in Chapter 2, qualities of intimate care - knowledge, esteem, and reliance – and the conceptual themes of self-knowledge and knowledge of others, self-esteem and esteem for others, and self-reliance and reliance on others, underpin my design approaches and directions, when addressing intimate care across the lifecourse. In planning to design for and with these themes in mind, I started by looking at designing for knowledge to raise awareness and promote prevention, designing for esteem to explore ideal scenarios and promote empathic engagement, and in designing for reliance I continued to identify shortcomings in favour of designing new caring mechanisms that ultimately innovate in the designing for and with intimate care. I draw upon the case studies introduced in Chapters 5, 6, and 7, to illustrate how different methods might be used within the domain of intimate care in women's health.

In Chapter 2, I started section 2.3.3. *Qualities of Intimate Care* by classifying body literacy as a quality of intimate care. Knowledge of the body can impact and strengthen the promotion of protective health behaviours and advocate for prevention. In this section, I provided the example of urinary incontinence in women to suggest that ***designing for prevention*** could

benefit the HCI perspective on designing for knowledge: understanding incontinence through education helps to promote continence care early enough to support living healthier longer. As I mention in Chapter 5, women within a consultation were rarely aware of their own intimate bodies, or knowledgeable about what was happening within it. Pelvic floor muscle exercises might have been heard of, however not necessarily understood fully.

In addition to reducing the risk of incontinence, a healthy pelvic floor muscle also promotes sexual wellbeing. Learning about pelvic floor muscle exercises is both part of continence promotion and health education (Freeman 2004). Furthermore, I consider how systems might empower people to increase agency over their bodies and the impact of technologies in transforming self-care. In Chapter 6, I approached methods that involve the body and hands-on activities to promote such basic education. Body-worn technologies are prolific in HCI (Loke & Robertson 2011, Wilde et al. 2011), and inventive approaches that support people in learning through making and play are gaining momentum (Andersen & Wilde 2012, Norooz & Froehlich 2013). Similarly to BodyVis (Norooz et al. 2015), which engages children in playful, interactive learning of the internal landscapes of the body through wearable e-textiles, I too attempted to relate technology to everyday life in an educational context - in the form of wearable, on-body technologies – to promote continence awareness among women and girls. In designing for knowledge by way of an interactive toolkit I aimed to promote discussion around a taboo subject which may be a sensitive and/or provocative exercise, but nonetheless introduced a topic that is related to real world practice. From the vast majority of participants' responses, I understood that learning about continence care was not sufficient in the sense of the embodied experience afforded by a determined biology, and the experience of the body as a whole, required a more holistic approach to knowing the intimate body and its parts. New technology designs in this area required a careful theoretical and practical conceptualization of the body space in question. In Chapter 7, I expanded on this to consider ***designing for (self)caring***. I previously referred to the quality of touch in intimate care, particularly in relation to the way that bodies touch or are touched by tools, and how such an event can determine the quality of the experience. I provided examples of different practices of care (Milligan & Wiles 2010, Twigg 2000), and looked at the example of (Rossmann 2008) to suggest that the tools and services associated with intimate care could be revolutionized to provide the desired experience. I believe that developing and building empathetic relationships with people is central to experiential design, and that the value of designing technology as experience (Wright & McCarthy 2010) fits into the physical and social context of clinical care and medical work. If designing for experience entails understanding what others feel and live through then designing with esteem facilitates this encounter. Moreover,

in designing for reliance I have suggested that the frontier of the body is a quality of what constitutes intimate care and that it is an interface that may require the negotiation of body taboos. Where that frontier lies depends upon the other and one's own lifecourse. It contributes to bring under control the one being cared for, and it challenges power relationships that reflect levels of trust, intimacy, or confidence. As the insight into the body changes along with technology advancements, so do formal care situations. ***Designing for diagnosis*** and technologies of convenience, such as the speculum, need to be re-imagined in relation to the body. Resistance to change by the medical professionals and industry contributes to hinder these processes (Rossmann 2008). To use the example discussed in Chapter 5, urinary incontinence in women, accounts of embarrassment are also mentioned in (Peake et al. 1999), as existing medical models for quantifying incontinence (urodynamic analysis) leave women feeling embarrassed and disempowered when confronted with their medical practitioners.

8.4 Approaches for Intervention

Through the perspectives afforded by the reading of literature and the observations undertaken within a clinical setting in women's health physiotherapy, I was first surprised by the lack of research, technology design and interventions for women's subjective experiences of their bodies in health and disease, a personal perspective that was strengthened while observing a medical practice. Furthermore, and in tandem with such period of observations, in exploring understandings of the body with communities of women, as detailed in Chapter 6, sustained my standpoint. While technologies for women's health exist, they do so as part of the medical apparatus or if within the personal, intimate realm subsist mainly as expression of an objective computation. Instead of assisting in and expanding such approaches to behaviour change and body maintenance, I sought to assist women in their (self) care through approaches in design and intervention that could contribute to promotion of care by inquiring active knowledge as means to encourage prevention as key to health and wellbeing throughout the lifecourse. It was my intent to create first, a toolkit that could communicate through capacity, i.e. empower women and girls in knowing about their bodily health via making activities that involved the body and intimate body parts; second, a system that advocates for bodily health and integrity by promoting an embodied interaction that reflects the body in self-awareness. Therefore, the design of the toolkit introduced in Chapter 6 responds to aspects identified in the literature, including those that detail the qualities of intimate care – knowledge, esteem, and reliance. The design of Labella, as discussed in Chapter 7, derived from the literature, observational work and was largely inspired by the

findings presented in Chapter 6, which demonstrated a certain lack of knowledge of the body amongst women and girls but, most importantly, asserted the need and desire expressed by both women and girls to wanting to be more aware and have a better grasp of their own health and wellbeing.

In responding to my third research question, *what are the challenges and opportunities of designing for women's health* and to *how can these technologies enable care of the self and the other*, I have highlighted the substantiated taboo of the subject in question, that of the intimate body. In creating artefacts to be used within a social context, such as in the case of the toolkit (Chapter 6), I anticipated that the visual imagery I prepared in combination with the topic would certainly lead to a variety of responses and raise some more questions. Unsurprisingly, some women and girls showed to be more comfortable in talking about it than others, although in general they all were actively engaged in the hands-on activities. Whether curious or wary, both women and girls reflected the desire to, if not to talk, then to listen about it. This was, after all, a topic (pelvic floor muscles and pelvic fitness), that they had either never heard about, or had heard about but were not necessarily sure on whether it was something they should be concerned about or involved in. The apparent lack of resources within the school curriculum, and access to trustworthy information to the wellbeing of women combined, admittedly contribute to this gap in bodily health knowledge – one which women may learn about only after becoming a patient body, e.g in pregnancy or in management of incontinence. Regarding the latest, the stigma associated with being incontinent leads to women having to suffer with it without knowingly being able to prevent or manage its occurrence in a timely fashion, resorting instead to occult the fact for as long as possible, and looking for help later in the process, as I described in Chapter 5.

I have described how taboo is one significant challenge of designing for intimate care in women's health, both from a theoretical viewpoint but also practically, through the deployment of the toolkit and the discussions during the workshops, described in Chapter 6. In designing systems that can address this challenge, I looked at different methods and a methodology that allowed me to explore diverse and innovative approaches to the task ahead. How would I cope when in situations such as those of the workshop, in which I had to make clear, for example, that I was coming in as a researcher and the designer of the toolkit, not as an expert doctor in women's health - in interviewing women and their partners at a point when I would be dealing with their sharing of exceptionally intimate information? Or, more importantly, would I manage to have my participants engaging with the toolkit or Labella, and

in the end would they be comfortable to talk about their experiences with me. One tool I used and must highlight is referred to in Chapter 2 as a functioning mechanism to deal with vulnerability in health and care, humour. I will describe what was achieved and how I envision humour within the realm of breaking the taboo and the de-stigmatizing of women's bodies in the next section 8.4.1.

Furthermore, I discussed how women's interactions and interactions between couples with Labella opened up avenues to consider the design of interventions and sociotechnical systems that promote and stimulate knowledge of the self and also of the other. As Marina and George mention in Chapter 7, the opportunity afforded by Labella to engage in conversation of topics that they wouldn't otherwise consider on a daily basis. Unless these topics are a priority, i.e. the woman (or man) requires medical assistance or support, they would rarely come up in conversation or be reason for concerns. Hence, that is exactly where I stress the opportunity for research and technology design in this field. Whether there are mechanisms in place to prevent or manage 'disease' of the intimate body - and I will return once again to the example of the speculum to illustrate and elaborate on this thought process - these are functioning in their ability to 1) assist primarily in diagnosis, which needs to be undertaken within the clinical institution and by the medical professional, 2) eventually contribute to prevention, if defined as the action taken to stop something from happening, by giving access to the medic to 'see'. Rather than supporting self-care more casually, and without adding to preconceptions of disease, current practices and cultures of medicalization contribute mostly to mystify the woman's (or man's) body, in relation to self-knowledge or knowledge of others, but also in perpetuating power structures that privilege laws or reinforce policies, guided by business models, detached from contemporary advances in (medical) knowledge and technologies. One fresh example is that proposed by NextGen Jane (NextGen 2016), which demonstrates potential for change in women's bodies and health, by bringing together and combining different technologies and expertise to take positive advantage of menstrual blood (Kennedy 2016).

8.4.1 *Advancing body politics through humour*

A somewhat different approach, as I hinted in the previous section, was the one I undertook while designing the toolkit and Labella. In enquiring *a woman-centred approach as a novel methodology to design that supports and enables care in women* I drew from multiple disciples including health, sociology, interaction design and feminist theory that have previously considered humour as a method and tool. As discussed in Chapter 2, interactions

that use humorous probes have been explored in e.g. (Sputniko 2010, Wilde 2012). While humour might have only recently been acknowledged within HCI research and design, it has certainly a longer history of being used for mediation of sensitive topics and settings, as it can facilitate communication, prompt amusement, and it has a disinhibiting effect (Ziegler 1998), while nonetheless enabling the expression of ideas and thoughts that otherwise might not be social, cultural, or politically accepted. Comparably, body politics is one contribution of feminism to a construction of counter-power that confronts hegemonic culture (Harcourt 2009) inasmuch humour in women serves both social and subversive roles (Naranjo-Huebl 1995) and can be thought of as a potential agent for positive change (Goldman 2013).

In exploring humour as an approach to designing for and with the body, I designed humorous artefacts and interactions that could be regarded as extending positive discourse, enhancing women's experience, and encouraging self-empowerment. In drawing from (Delaney 2011), I too embraced designing with humour as a method to harness the power to transform women's perception of what might be considered an unpleasant experience, and also the power to initially create a positive bodily experience. Most significantly, I used humour as a design tool for enhancing laughter, fun, or women (users)' satisfaction (Yu & Nam 2014), and as a method of strategic communication for teaching and making accessible topics of research that are sensitive. In applying humour as a design strategy, I explored humour's strategic use in inciting positive reactions, e.g. stimulate curiosity, and positive design goals, such as having an educational and political effect. In exploring the intersection of humour and bodily taboos, as an example of a social-cultural issue, I seek to highlight the potential of humour and humorous interactions or artefacts as catalysts for social change.

As discussed in Chapter 2, humour in women is characterized by dissimilarities in gendered funniness (Crawford 2003) and is empowering in that it facilitates an ability to act (Naranjo-Huebl 1995). In this thesis, I focus on critical-humanist approaches to designing interactions and artefacts that emphasize a woman's power and control over her own body through extended knowledge. While feminist body politics pioneered in the 1970s emphasized such power and contributed to deepen women's knowledge of workings of their bodies, today such feminist politics further endorse a range of body modification and gender practices. My approach to humour and using humour in design was positioned as a creative approach to visually recreate intimate bodily organs and experiences, as much as a strategy to mitigate interactions that otherwise could be intimidating, in the case of this thesis, to women participants in my studies. This was achieved by and with the designs discussed in Chapters 6

and 7, which intended to start a conversation around and about intimate care in women and body literacy as critical to challenging women's health and wellbeing.

8.5 Future Work

In pursuing *a woman-centered methodological approach* I drew from multiple philosophical perspectives, including feminist theories and science and technology studies, to inform my practice and to position women and their bodies within society. The research was led by design and aimed to promote critical thinking in practice-based research to develop new understandings that would inform social innovation in tools and techniques for future health. *Woman-Centred Design* is in tandem with this approach in that it is crucial to design with care in the context of women's health but also as an inclusive approach for ensuring that the potential for social innovation is realised and delivered.

Creative and inventive methods to design have the potential to contribute to sensitive and taboo topics in HCI research. The adoption of such methods, e.g. critical design, by the community is limited (Bardzell & Bardzell 2013), and research that discusses intimate care, with a focus on bodywork, is not yet available. As way of example, I will briefly discuss three case studies that apply a critical design through research methodology to work that place the body as a future lens to relate to possibilities of intimate technologies. Speculative design proposals are used in critical design, and they use fiction to present alternative products and systems for the here and now. Two examples of speculative design are the aforementioned Menstruation Machine (Sputniko 2010), and Evidence dolls by Dunne and Raby, a series of design probes that provoke discussions about the implications of emerging technologies such as genetics in relation to reproduction (Dunne & Raby 2005). Conceptual design is another relative of critical design, and such an example is Lucy McRae's Swallowable Parfum, which pushes the boundaries of the role of skin, and internalizes what has previously been an external bodily practice (Burton 2013).

The design exemplars described above look at the body as an access point for technology to enter and as a medium to manipulate, they intersect with qualities of intimate care as I define them, namely that of dissolution of boundaries between the body and technology - implantable, genetic, biologically enhanced, or contraceptive - the impressions left by human enhancement on personal, cultural, and physiological conditions, and the design knowledge of the body. As much as these design exemplars may seem uncanny, they are proposals dealing with sensitive subjects and each embody a given criticality dimension. They propose

alternative approaches to physiological phenomenon by incorporating biotechnology, genetics, or synthetic biology into everyday forms. As I have argued, technology has a profound mediating effect on the way we relate, obtain knowledge, and contribute to society (Peer et al. 2013), most technologies configure their user as a consumer and not as an active participant, and the rise of DIY (Do-It-Yourself) approaches to what once was inaccessible or institutionally bound technologies create opportunity for change. Reliance on the self and on others is marked by a shift, and new frontiers need to be re-scripted. More and more, we incorporate self-diagnostic devices and medicating technologies. Is technology transforming self-care and starting to disrupt clinical care? How are new technologies empowering everyone as activists for personal wellbeing? If intimate care is a taboo subject, what can critical approaches to design contribute to demystify it? By adopting design as critique for knowledge, esteem, and reliance, I attempted to propose alternative possibilities to the existing status quo, and to open avenues for future research and researches working in similar topics and disciplines by giving visibility to such fundamental aspects of women's lives and bodily experiences in relation to caring technologies.

Labella v.02

Figure 21: Examples of underwear with bespoke screenprinted marker design for future iterations with Labella

While Labella was initially designed with a wide range of women in mind, future developments will be aimed at young women, providing them with an educational tool which will enable them to get to know their bodies in a way that feels comfortable and knowledge driven.

Future iterations will explore the embodied interaction in a thorough manner as the wearer holding the phone moves it top-bottom or closer/further away from the body to explore the crotch pattern/ the female perineum. By holding the phone away (as possible) from the body she will see an augmentation of the whole female perineum on the screen. As she is holding the phone close or closer to the body she will see different parts augmented, e.g. if the camera

phone recognizes the vulvar area it will show the vulva comprising of the external genital organs; the opening of the vagina will show the opening with the option to explore the reproductive organs on screen. Similar to the study's working prototype, when touching different parts on the screen it will show corresponding and appropriate information.

8.5.1 *Possible areas of intervention*

With Labella I aimed to explore how digital technologies can be harnessed in support of managing embarrassment and sexuality in self-care and care of others in these intimate spaces (Meerabeau 1999); how embodied interactions inform looking to promote learning about hidden parts of the body; how learning is awkward when applied to sensitive and intimate topics, but that such awkward learning can be facilitated by humour; how a contextualized exploration of the body is embedded in our physical, social, and emotional settings, and is affected by different kinds of everyday technology.

As a technology-led innovation, Labella can contribute a novel interactive personal approach to gaining access to information about the body, to widen understanding of and contribute to informed decision making on rights to health, choices, and body integrity. In line with this, I envision future developments of Labella to be deployed within varied contexts and concept and visual design to sit within social-cultural perspectives. One such example would be to adapt Labella to encompass female genital mutilation/cutting (FGM/C), by which it could serve as a tool for primary prevention. Moreover, research shows that there is a link to the occurrence of incontinence and FGM/C, strengthening the need to establish a connection between reproductive health, bodily integrity, and pelvic fitness (Peterman & Johnson 2009).

Furthermore, as I introduced in the article I wrote for The Conversation UK (Almeida 2016), in May 2016, I hope that Labella will have a role to play in helping to break this cycle of bodily taboos that are barriers to knowledge and self care, while also improving women's comfort and esteem within a clinical environment e.g. at their next smear test. This development could help to break some of the societal shame that surrounds the female anatomy and could even lead to a decline in the number of women getting diagnosed with cervical cancer, one of the most common in women.
Nevertheless, this article was re-published in e.g. The Independent, which led to a number of outlets, online and print magazines, to contact me seeking for an interview and consequently

publishing a piece on the research[5]. Evidence of such outreach, strengthen by statistics available on the May 2016 — Research Engagement report by The Conversation UK, which shows the piece to have had 621,356 reads, and that (Almeida et al. 2016) remained (submission September 2016) one of the top 10 downloaded papers on ACM since made available online in May 2016, is reassuring in that, not only there is a pressing need to design for women's bodies/intimate bodily spaces, but also that there is a genuine interest and overall desire for knowledge within this scope of research.

8.6 Conclusion

In this concluding section, I introduce reflexive considerations about my overall experience throughout the duration of this research. As I progressed, I started *approaching women's health as a human rights issue*. I became deeply interested in extending my research on and around creative technology and design that enables knowledge in health and body literacy in women. This included promoting capacity in varied socio-cultural and political settings and, as mentioned in 8.5.1, pursue topics that will allow me to explore the potential of novel and creative ways for technology to improve women's experiences in health transactions, choices, and rights.

Technology and the body have long been at the interdisciplinary crossing between the arts, humanities, and sciences. The vision at heart of this research was to explore the cross-pollination between practices and the design of technologies for and with the female body, as it changes throughout the lifecourse and as it encounters technological advancements. The research is grounded in the interdisciplinary field of Human-Computer Interaction (HCI) and, no less, aspires to speak to other disciplinary fields such as medical sciences, human geography, or ethics: change can only be achieved if epistemological contributions are cross-disciplinary and communicated across fields of research.

I was interested in putting forward methods that afford the possibility of inventiveness towards gender awareness and that can contribute to designing future artefacts that, by incorporating a gender script, can shape and define agency of all sexes. While deliberately speculative, this approach takes culture as crucial to revolutionize health and wellbeing by highlighting how our relationship to our body can shape our place in society. Scientific research lays its ground on objectivity and epistemic authority and that is fundamental. Alas, I argue that in order to explore novel human-technology relationships that value the needs, desires, and experiences of women in health and care, we need to account for each and every

[5] Press on Labella can be found here: http://www.banhomaria.net/intimatecare/Labella/index.html

woman. *Women by Numbers,* or the case for 'the number of participants', when using a woman-centered methodological approach to design, becomes to a certain extent meaningless. I say this based on this research, both due to the obstacles encountered along the way, for example, 1) women shying away from taking part in group activities but available for a solo discussion, being part of a group activity or discussion involves being exposed to sensitive topics among other women 2) the richness of interaction within a group or through one-on-one dialogue can be significantly different when it comes to discussion or sharing information, and each and every woman surely has a meaningful say in the matter at hands In this sense, validation of methods that rely heavily on number of participants is somewhat counterproductive when applying a woman-centered approach to design, when ultimately the strength of such woman-centered approach stands for *woman* herself.

Closing Comments

The research presented in this thesis explored the design of technologies for intimate care for promoting women's experiences in health and wellbeing. While research on women's health is still underexplored in HCI, I described how the field could (and should) engage with 'awkward particulars' of women's bodies and disruptive gender subjectivities.

I started by defining and conceptualizing intimate care in women, which led me to outline a series of qualities significant to design. Using a case study of intimate care within women's health – that of urinary incontinence – I have shown how women's health is often linked to a diversity of disruptions to the body that demand for professional intimacy of care and continued self-care. Yet, I also showed how lack of body knowledge bounded to taboo come together to create conditions which leads to a diminished health experience. There are numerous existing technologies and systems which have the potential to vastly improve women's experiences of these health transactions, from tools to better visualize and talk about the hidden parts of the body, through to DIY communities which share and analyse the outcomes of home-based examinations. However, research and design that address the 'dirty work' in women's health and wellbeing is mostly absent in HCI discourses. In responding to this, my thesis suggests routes for exploring this fascinating, important, yet difficult area in ways which can benefit those receiving intimate care, as well as benefit HCI perspectives on designing for health and wellbeing.

Specifically, I introduced: (i) intimate care by situating it as care work on the body and across the lifecourse, as prone to body disruptions, and intertwined in taboo; (ii) qualities of intimate

care: self-knowledge and knowledge of others, self-esteem and esteem for others, and self-reliance and reliance on others, which underpin the criteria for technologies of intimate care in this research and advances a design framework for future work by others (iii) possibilities for digital interactions and technologies for intimate care as introduced in the case studies, in which I explored humour in design as a method to support learning of sensitive topics and as a tool to diminish the taboo nature of the interaction. I outlined a woman-centered approach as methodology, to generate new insights into the potential of woman-centered design to provide telling, accessible, and engaging technologies.

Discussing some of the challenges of designing technologies for intimate care in women, and working in and within topics that are sensitive and taboo, I described a range of different approaches to women's health which can support and engage the woman (and man) in knowledge of her body, and promote preventative care health practices and wellbeing. Lastly, I highlighted possible areas of intervention in women's health which I consider significant and critical, based on the agenda for change this thesis puts forward and lays the groundwork for.

Bibliography

Abel, E.K. & Nelson, M.K. eds., 1990. *Circles of Care: Work and Identity in Women's Lives* SUNY Series, Albany: State University of New York Press.

Akrich, Madeleine. 1992. "The De-Scription of Technical Objects" In *Shaping Technology/Building Society: Studies in Sociotechnical Change*, edited by Wiebe E. Bijker and John Law, 205–24. The MIT Press.

Alam, M., Khanam, T. & Khan, R., 2010. Assessing the scope for use of mobile based solution to improve maternal and child health in Bangladesh: A case study. In *4th ACM/IEEE International Conference on Information and Communication Technologies and Development (ICTD '10)*.

Almeida, T., 2016. Here's a new way to look at your vagina – it might just save your life. *The Conversation UK*. Available at: https://theconversation.com/heres-a-new-way-to-look-at-your-vagina-it-might-just-save-your-life-59021 [Accessed September 17, 2016].

Almeida, T. et al., 2014. Intimate Care : Exploring eTextiles for Teaching Female Pelvic Fitness. In *Proc. of Designing Interactive Systems* (*DIS Companion '14)*. pp. 5–8.

Almeida, T. et al., 2016. On Looking at the Vagina through Labella. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '16)*. pp. 1810–1821.

Ananthanarayan, S. et al., 2013. PT Viz: Towards a Wearable Device for Visualizing Knee Rehabilitation Exercises. In *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. pp. 1247–1250.

Ananthanarayan, S. et al., 2014. Towards the crafting of personal health technologies. In *Proc. of Designing Interactive Systems* (*DIS '14)*. New York, New York, USA: ACM Press, pp. 587–596. Available at: http://dl.acm.org/citation.cfm?doid=2598510.2598581.

Andersen, K. & Wilde, D., 2012. Circles and Props - Making Unknown Technology. *Interactions*, (May-June).

Armstrong, D., 1983. *Political Anatomy of the Body: Medical Knowledge in Britain in the Twentieth Century*, Cambridge University Press.

Atkinson, S., 2011. Scales of care and responsibility: debating the surgically globalised body. *Social & Cultural Geography*, 12(6), pp.623–637. Available at: http://www.tandfonline.com/doi/abs/10.1080/14649365.2011.601263 [Accessed September 2, 2013].

Auger, J., 2013. Speculative design: crafting the speculation. *Digital Creativity*, 24(1), pp.11–35. Available at: http://www.tandfonline.com/doi/abs/10.1080/14626268.2013.767276 [Accessed November 20, 2014].

Azuma, R.T., 1997. A Survey of Augmented Reality. *Presence: Teleperators and Virtual Environments 6*, 4(August), pp.355–385.

Balaam, M. et al., 2015. FeedFinder: A Location-Mapping Mobile Application for Breastfeeding Women. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*. pp. 1709–1718.

Bannon, L., 2011. Reimagining HCI: Toward a More Human-Centered Perspective. *Interactions*, pp.50–57.

Barad, K., 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Duke University Press.

Bardzell, J. et al., 2012. Panel : The Humanities and/in HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. pp. 1135–1138.

Bardzell, J. et al., 2014. The Lonely Raccoon at the Ball: Designing for Intimacy, Sociability, and Selfhood. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. pp. 3943–3952.

Bardzell, J. & Bardzell, S., 2011a. " Pleasure is Your Birthright ": Digitally Enabled Designer Sex Toys as a Case of Third-Wave HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 257–266.

Bardzell, J. & Bardzell, S., 2015. Humanistic HCI. Morgan & Claypool Publishers.

Bardzell, J. & Bardzell, S., 2011b. "Pleasure is Your Birthright": Digitally Enabled Designer Sex Toys as a Case of Third-Wave HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 257–266.

Bardzell, J. & Bardzell, S., 2013. What is "critical" about critical design? In *Proc. of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. New York, New York, USA: ACM Press, p. 3297. Available at: http://dl.acm.org/citation.cfm?doid=2470654.2466451.

Bardzell, J., Bardzell, S. & Hansen, L.K., 2015. Immodest Proposals: Research Through Design and Knowledge. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*. pp. 2093–2102.

Bardzell, S. et al., 2011. Feminism and interaction design. In *Proc. of the 2011 annual conference extended abstracts on Human factors in computing systems (CHI EA '11)*. New York, New York, USA: ACM Press, p. 1. Available at: http://portal.acm.org/citation.cfm?doid=1979742.1979587.

Bardzell, S., 2010. Feminist HCI: Taking Stock and Outlining an Agenda for Design. In Proc. *of ACM SIGCHI Conference on Human Factors in Computing Systems* (*CHI '10)*. pp. 1301–1310.

Bardzell, S. & Bardzell, J., 2011a. Towards a Feminist HCI Methodology: Social Science, Feminism, and HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 675–684.

Bardzell, S. & Bardzell, J., 2011b. Towards a Feminist HCI Methodology: Social Science, Feminism, and HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 675–684.

Bardzell, S. & Churchill, E., 2011. IwC Special Issue "Feminism and HCI: New Perspectives" Special Issue Editors' Introduction. *Interacting with Computers*, 23.

BBC, 2015. The women "live-tweeting" their periods to campaign against Trump. *BBC Trending*. Available at: http://www.bbc.co.uk/news/blogs-trending-33863958 [Accessed September 24, 2015].

Benford, S. et al., 2012. Uncomfortable Interactions. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems* (*CHI '12)*.

Bichard, J. et al., 2012. Tackling Ageing Continence through Theory, Tools & Technology (TACT3). *Aging & Society*, 1(2).

Bijker, W.E. et al., 2012. *The social construction of technological systems: New directions in the sociology and history of technology*, MIT Press.

Bø, K. & Sherburn, M., 2005. Evaluation of Female Pelvic-Floor Muscle Function and Strength. *Physical Therapy*, pp.269–282.

Bødker, S., 2015. Third-Wave HCI, 10 Years Later-Participation and Sharing. *Interactions*. Available at: http://interactions.acm.org/archive/view/september-october-2015/third-wave-hci-10-years-later-participation-and-sharing#R1 [Accessed September 8, 2016].

Bødker, S., 2005. When second wave HCI meets third wave challenge s. In Proc. of *NordiCHI '05*.

Boyer, K. & Boswell-Penc, M., 2010. Breast Pumps. In L. L. Layne, S. L. Vostral, & K. Boyer, eds. *Feminist Technology*. University of Illinois Press, pp. 119–135.

Branney, P. et al., 2014. Masculinities, humour and care for penile cancer: a qualitative study. *Journal of Advanced Nursing*, 70(9), pp.2051–60. Available at: http://www.ncbi.nlm.nih.gov/pubmed/24612296 [Accessed September 5, 2015].

Braun, V., 1999. Breaking a Taboo? Talking (and Laughing) about the Vagina. *Feminism & Psychology*, 9(3), pp.367–372.

Braun, V. & Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, pp.77–101.

Braun, V. & Ensler, E., 1999. Public Talk about "Private Parts." *Feminism & Psychology*, 9(4), pp.515–522.

Braun, V. & Kitzinger, C., 2001. "Snatch," "Hole," or "Honey‐pot"? Semantic categories and the problem of nonspecificity in female genital slang. *The Journal of Sex Research*, 38(2), pp.146–158.

Braun, V. & Wilkinson, S., 2001. Socio-cultural representations of the vagina. *Journal of Reproductive and Infant Psychology*, 19(1), pp.17–32. Available at: http://www.tandfonline.com/doi/abs/10.1080/02646830020032374 [Accessed October 8, 2014].

Brewer, J. et al., 2006. Sexual Interactions : Why we should talk about sex in HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '06)*. pp. 1695–1698.

Bronet, F. & Layne, L.L., 2010. Teaching Feminist Technology Design. In L. L. Layne, S. L. Vostral, & K. Boyer, eds. *Feminist Technology*. University of Illinois Press, pp. 179–196.

Buechley, L. & Perner-Wilson, H., 2012. Crafting technology. *ACM Transactions on Computer-Human Interaction*, 19(3), pp.1–21. Available at: http://dl.acm.org/citation.cfm?doid=2362364.2362369 [Accessed April 3, 2013].

Burton, L., 2013. Evolutionary Scents: Lucy McRae's Swallowable Parfum. Available at: http://www.inter-disciplinary.net/. [Accessed September 25, 2015].

Bustreo, F., 2015. Promoting health through the life-course: Ten top issues for women's health. *WHO*. Available at: http://www.who.int/life-course/news/commentaries/2015-intl-womens-day/en/ [Accessed September 3, 2016].

Butts, J.B., 2001. Outcomes of comfort touch in institutionalized elderly female residents. *Geriatric Nursing*, 22(4), pp.180–184.

C. Nussbaum, M., 2000. *Women and Human Development*, New York, NY: Cambridge University Press.

Callon, M., Law, J. & Rip, A., 1986. *Mapping the dynamics of science and technology*, Palgrave MacMillan, UK.

Cassell, J., 2002. Genderizing HCI. In *The Handbook of Human-Computer Interaction*. Mahwah, NJ: Lawrence Erlbaum, pp. 402–411.

Castro, R. a, Arruda, R.M. & Bortolini, M. a T., 2015. Female urinary incontinence: effective treatment strategies. *Climacteric: the journal of the International Menopause Society*, 18(2), pp.135–41. Available at: http://www.ncbi.nlm.nih.gov/pubmed/25307986 [Accessed September 22, 2015].

Chalmers, J. & Jones, C., 2016. Why the clitoris doesn't get the attention it deserves – and why this matters. *The Conversation*. Available at: https://theconversation.com/why-the-clitoris-doesnt-get-the-attention-it-deserves-and-why-this-matters-53157 [Accessed May 4, 2016].

Chapman, S., 1995. Great expectorations! The decline of public spitting: lessons for passive smoking? *BMJ (Clinical research ed.)*, 311(7021), pp.1685–6. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2539083&tool=pmcentrez&rendertype=abstract.

Chardronnet, E., 2015. GynePunk, the cyborg witches of DIY gynecology. *Makery*. Available at: http://www.makery.info/en/2015/06/30/gynepunk-les-sorcieres-cyborg-de-la-gynecologie-diy/ [Accessed September 24, 2015].

Chenette, P. & Martinez, C., 2014. Synchronization of women's cycles: a big data and crowdsourcing approach to menstrual cycle analysis. *Fertility and Sterility*, 102(3), p.e250. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0015028214014800 [Accessed September 25, 2015].

Chiaro, 2015. Elvie. Available at: https://www.elvie.com/. [Accessed September 25, 2015].

Clarke, R. et al., 2013. Digital Portraits : Photo-sharing After Domestic Violence. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. pp. 2517–2526.

Conrad, P., 2013. Medicalization: Changing Contours, Characteristics, and Contexts. In W. C. Cockerham, ed. *Medical Sociology on the Move*. Dordrecht: Springer Science + Business Media, pp. 195–214.

Crawford, M., 2003. Gender and humor in social context. *Journal of Pragmatics*, 35, pp.1413–1430.

Dantec, C.A. Le & Edwards, W.K., 2008. Designs on Dignity : Perceptions of Technology Among the Homeless. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '08)*.

Dean, K., 1989. Self-care components of lifestyles: the importance of gender, attitudes and the social situation. *Social science & medicine*, 29(2), pp.137–52. Available at: http://www.ncbi.nlm.nih.gov/pubmed/2749299.

Deans, R., 2013. Vagina Diaries draws attention to hidden cost of labiaplasty. *The Conversation*. Available at: https://theconversation.com/whats-normal-anyway-gps-should-discourage-women-from-unnecessary-genital-surgery-45650 [Accessed May 4, 2016].

Delaney, C., 2011. *Humor-Centered Design: Using Humor as a Rhetorical Approach in Design*. Carnegie Mellon University.

Delphi, 2014. Delphi Screener. Available at: http://delphiscreener.com/Home/Paginas/default.aspx.html [Accessed September 4, 2016].

Deterding, S. et al., 2015. Embarrassing Interactions. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems* (*CHI EA '15)*. Available at: http://embarrassinginteractions.org/ [Accessed September 4, 2016].

Devine, C., 2008. *The Moon, the Stars and a Scar Body Mapping Stories of Women Living with HIV/AIDS*, Border Crossings. CATIE, Canada.

Dib, L., Petrelli, D. & Whittaker, S., 2010. Sonic Souvenirs: Exploring the Paradoxes of Recorded Sound for Family Remembering. In *Proc. of CSCW 2010*. pp. 391–400.

Diprose, R. & Reynolds, J. eds., 2008. *Merleau-Ponty: Key Concepts*, Acumen Publishing Ltd.

Dombrowski, L., Harmon, E. & Fox, S., 2016. Social Justice-Oriented Interaction Design: Outlining Key Design Strategies and Commitments. In Proc. of *DIS '16*. pp. 656–671.

Dormann, C. & Biddle, R., 2007. Humour in game‐based learning. *Learning, Media and Technology*, 31(4), pp.411–424. Available at: http://www.tandfonline.com/doi/abs/10.1080/17439880601022023 [Accessed September 5, 2015].

Dourish, P., 2001. *Where the Action Is: The Foundations of Embodied Interaction*, Cambridge, Massachusetts: MIT Press.

Dunne, A. & Raby, F., Evidence Dolls. Available at: http://www.dunneandraby.co.uk/content/projects/69/0. [Accessed September 22, 2016]

Dunne, A. & Raby, F., 2013. *Speculative Everything: design, fiction, and social dreaming*, MIT Press.

Durrant, A. et al., 2011. Automics: Souvenir Generating Photoware for Theme Parks. In *Proc.* of *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 1767–1776.

Eaglin, A. & Bardzell, S., 2011. Sex toys and designing for sexual wellness. In *Proc.of the 2011 annual conference extended abstracts on Human factors in computing systems (CHI EA '11)*. Vancouver, BC, Canada: ACM Press, p. 1837. Available at: http://portal.acm.org/citation.cfm?doid=1979742.1979879.

Enquist, H. & Tollmar, K., 2008. The Memory Stone – A Personal ICT Device in Health Care. In *NordiCHI '08 Proceedings of the 5th Nordic conference on Human-computer interaction*. New York, NY: ACM Press, pp. 103–112.

Ensler, E., 2001. *The Vagina Monologues*, London: Virago.

FitBit, Fitbit. Available at: http://www.fitbit.com/uk [Accessed September 16, 2016].

Foucault, M., 1979. *Discipline and Punish: The Birth of the Prison*, New York: Vintage Books.

Fox, S., Ulgado, R.R. & Rosner, D.K., 2015. Hacking Culture, Not Devices: Access and Recognition in Feminist Hackerspaces. In *CSCW 2015*. pp. 56–68.

Freeman, R.M., 2004. The role of pelvic floor muscle training in urinary incontinence. *BJOG : an international journal of obstetrics and gynaecology*, 111 Suppl (December), pp.37–40. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15663155.

Frischherz, M., 2015. Affective Agency and Transformative Shame: The Voices Behind The Great Wall of Vagina. *Women's Studies in Communication*, 38(3), pp.251–272.

Gallagher, C. & Laqueur, T. eds., 1987. *The Making of the Modern Body*, University of California Press.

Gastaldo, D. et al., 2012. Body-Map Storytelling as Research: Methodological considerations for telling the stories of undocumented workers through body mapping. Available at: http://www. migrationhealth.ca/undocumented-workers-ontario/body-mapping

GaudiLab, The GaudiLab. Available at: http://www.gaudi.ch/GaudiLabs/?page_id=2 [Accessed September 24, 2015].

Gauntlett, D. & Holzwarth, P., 2006. Creative and visual methods for exploring identities. *Visual Studies*, 21(01), pp.82–91.

Gaver, B., 2009. Designing for Homo Ludens, Still. In T. Binder, J. Löwgren, & L. Malmborg, eds. *(Re)searching the Digital Bauhaus*. London: Springer, pp. 163–178.

Gaver, B.W.W., Eluard, P. & Péret, B., 2004. Cultural Probes and the Value of Uncertainty. *Interactions*, pp.53–56.

Gaver, W., 2002. Designing for homo ludens. *I3 Magazine*, pp.3–6. Available at: http://luna.gold.ac.uk/media/27gaver.ludens.02.pdf [Accessed January 8, 2013].

Gaver, W., 2012. What should we expect from research through design? In *Proc. of the 2012 ACM annual conference on Human Factors in Computing Systems (CHI '12)*. New York, New York, USA: ACM Press, p. 937. Available at: http://dl.acm.org/citation.cfm?doid=2207676.2208538.

Goldman, N., 2013. Comedy and Democracy: The Role of Humor in Social Justice. *Animating Democracy/Americans for the Arts*.

Grosz, E., 1994. *Volatile Bodies, toward a corporeal feminism* T. de Lauretis, ed., Indiana University Press.

GynePunk, GynePunk. Available at: http://gynepunk.tumblr.com/ [Accessed September 24, 2015].

Hale, S., Grogan, S. & Willott, S., 2009. "Getting on with it": Women's Experiences of Coping with Urinary Tract Problems. *Qualitative Research in Psychology*, 6(3), pp.203–218. Available at: http://www.tandfonline.com/doi/abs/10.1080/14780880701876882 [Accessed February 13, 2013].

Halfmann, D., 2011. Recognizing medicalization and demedicalization: Discourses, practices, and identities. *Health*, (May).

Hamington, M., 2004. *Embodied Care: Jane Addams, Maurice Merleau-Ponty, and Feminist Ethics*, University of Illinois Press.

Hammersley, M. & Atkinson, P., 2007. *Ethnography* Third Edit., Routledge.

Haque, M. et al., 2012. Findings of e-ESAS: a mobile based symptom monitoring system for breast cancer patients in rural Bangladesh. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. pp. 899–908.

Harcourt, W., 2009. *Body Politics in Development: Critical Debates in Gender and Development*, Zed Books Ltd.

Hartofelis, E.C. & Gomez, A.M., 2013. Trans Men's Health is a "Women's Health" Issue: Expanding the Boundaries of Sexual & Reproductive Health Care. *National Women's Health Network*. Available at: https://www.nwhn.org/trans-mens-health-is-a-womens-health-issue-expanding-the-boundaries-of-sexual-reproductive-health-care/ [Accessed August 11, 2016].

Hassenzahl, M. et al., 2012. All You Need is Love. *ACM Transactions on Computer-Human Interaction*, 19(4), pp.1–19. Available at: http://dl.acm.org/citation.cfm?doid=2395131.2395137 [Accessed September 18, 2013].

van den Heuvel, E. et al., 2012. *Tackling ageing incontinence through theory, tools and technology (TACT3)*. Brunel University, UK.

Hutchinson, H. et al., 2003. Technology Probes : Inspiring Design for and with Families. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '03)*. Ft. Lauderdale, Florida, pp. 17–24.

Ignazio, C.D. et al., 2016. A Feminist HCI Approach to Designing Postpartum Technologies: "When I first saw a breast pump I was wondering if it was a joke." In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '16)*.

Immadisetty, V., 2012. *Body mapping: a novel tool for psychiatrists*. Case Report, UK.

Irigaray, L., 2008. *Conversations*, London: Continuum.

Irigaray, L., 1985. *This sex which is not one*, Ithaca, New York: Cornell University Press.

Jablonski, R. a et al., 2009. Mouth care in nursing homes: knowledge, beliefs, and practices of nursing assistants. *Geriatric nursing*, 30(2), pp.99–107. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19345849 [Accessed September 16, 2013].

Jawbone, Jawbone. Available at: https://jawbone.com/ [Accessed September 16, 2016].

Johnson, D.G., 2010. Sorting Out the Question of Feminist Technology. In L. L. Layne, S. L. Vostral, & K. Boyer, eds. *Feminist Technology*. University of Illinois Press, pp. 36–54.

Johnson, H.A., 1990. Humor As an Innovative Method for Teaching Sensitive Topics. *Educational Gerontology*, 16(6), pp.547–559. Available at: http://www.tandfonline.com/doi/abs/10.1080/0380127900160605 [Accessed October 15, 2014].

JoTrust, 2015. SmearForSmear. Available at: http://www.jostrust.org.uk/smearforsmear/ [Accessed September 24, 2015].

Kafai, Y. et al., 2013. Cupcake Cushions, Scooby Doo Shirts, and Soft Boomboxes: E-Textiles in High School to Promote Computational Concepts, Practices, and Perceptions. In Proc. of *SIGCSE'13*. pp. 311–316.

Kannabiran, G., Bardzell, J. & Bardzell, S., 2011. How HCI Talks about Sexuality : Discursive Strategies , Blind Spots , and Opportunities for Future Research. In *Proc.of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 695–704.

Kapsalis, T., 1997. *Public Privates: Performing Gynecology from Both Ends of the Speculum*, Duke University Press.

Karjalainen, L. et al., 2016. Self-sampling in cervical cancer screening: comparison of a brush-based and a lavage- based cervicovaginal self-sampling device. *BMC Cancer*, pp.1–10. Available at: http://dx.doi.org/10.1186/s12885-016-2246-9.

Katterfeldt, E.-S., Dittert, N. & Schelhowe, H., 2009. EduWear : Smart Textiles as Ways of Relating Computing Technology to Everyday Life. In *Proc. of Interaction Design and Children (IDC 2009)*. pp. 9–17.

Kaye, J. "Jofish" & Goulding, L., 2004. Intimate objects. In *Proc. DIS 2004*. New York, New York, USA: ACM Press, p. 341. Available at: http://portal.acm.org/citation.cfm?doid=1013115.1013175.

Kennedy, P., 2016. The Tampon of the Future. *The New York Times*. Available at: http://www.nytimes.com/2016/04/03/opinion/sunday/the-tampon-of-the-future.html?_r=0 [Accessed September 15, 2016].

Kosaka, T. et al., 2011. "Mommy Tummy" A pregnancy experience system simulating fetal movement. In Proc. of *SIGGRAPH 2011*.

Kowalski, R., Loehmann, S. & Hausen, D., 2013. cubble: a multi-device hybrid approach supporting communication in long-distance relationships. In *Proc. of the 7th International Conference on Tangible, Embedded and Embodied Interaction*. pp. 201–204.

Kuhn, T.S., 2012. *The structure of scientific revolutions*, University of Chicago Press.

Kumar, N. & Anderson, R.J., 2015. Mobile Phones for Maternal Health in Rural India. In Proc. of *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*. pp. 427–436.

Kuznetsov, S. et al., 2012. At the Seams: DIYbio and Opportunities for HCI. In *Proc. of DIS '12*. pp. 258–267.

Kuznetsov, S. et al., 2011. Breaking Boundaries : Strategies for Mentoring through Textile Computing Workshops. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 2957–2966.

Labuski, C., 2008. Virginal Thresholds. In L. Irigaray & M. Green, eds. *Luce Irigaray: Teaching*. New York, NY: Continuum, pp. 13–23.

Labuski, C., 2013. Vulnerable Vulvas: Female Genital Integrity in Health and Dis-ease. *Feminist Studies*, 39(1), pp.248–276.

Latour, B. & Woolgar, S., 2013. *Laboratory life: The construction of scientific facts*, Princeton University Press.

Layne, L.L., 2010. Why the Home Pregnancy Test Isn't the Feminist Technology It's Cracked Up to Be and How to Make It Better. In L. L. Layne, S. L. Vostral, & K. Boyer, eds. *Feminist Technology*. University of Illinois Press, pp. 89–118.

Layne, L.L., Vostral, S.L. & Boyer, K. eds., 2010. *Feminist Technology*. Urbana, Chicago, and Springfield: University of Illinois Press.

Lee, M. et al., 2015. Understanding Women's Needs in Menopause for Development of mHealth. In *Workshop on Pervasive Wireless Healthcare (MobileHealth '15)*. pp. 51–56.

Lee, R.M., 1993. *Doing Research on Sensitive Topics*, London: SAGE Publications Ltd.

Lennon, K., 2010. Feminist Perspectives on the Body. *Stanford Encyclopedia of Philosophy*. Available at: http://plato.stanford.edu/entries/feminist-body/#LivFemBod [Accessed September 24, 2015].

Lewis, E., 2011. Kegel Organ. Available at: http://www.erinlewis.ca/Kegel_Organ.html [Accessed September 24, 2015].

Light, Ann, and Yoko Akama. 2014. "Structuring Future Social Relations: The Politics of Care in Participatory Practice." In *Proc. of Participatory Design Conference* (*PDC '14)*.

Loke, L. & Robertson, T., 2011. The Lived Body in Design : Mapping the Terrain. In *Proc. of OZCHI 2011*.

Lombardo, P.A., 2015. How to Escape the Doctor's Dilemma? De-Medicalize Reproductive Technologies. *Journal of Law, Medicine & Ethics*, (Summer), pp.326–329.

Lupton, D., 1994. *Medicine as Culture: Ilness, Disease and the Body in Western Societies*, London: SAGE Publications Inc.

Lupton, D., 2014a. Quantified sex: a critical analysis of sexual and reproductive self-tracking using apps. *Culture, Health & Sexuality: An International Journal for Research, Intervention and Care* (February 2015), pp.37–41.

Lupton, D., 2014b. Self-tracking Cultures : Towards a Sociology of Personal Informatics. In *Proc. of OzCHI 2014*. Sydney, pp. 77–86.

Lury, C. & Wakeford, N. eds., 2014. *Inventive Methods: The happening of the social*, Routledge.

Malpass, M., 2013. Between Wit and Reason: Defining Associative, Speculative and Critical Design in Practice. *Design and Culture*, 5(3), pp.333–356.

Martin, E., 1997. Medical Metaphors of Women's Bodies. In K. Conboy, N. Medina, & S. Stanbury, eds. *Writing on the body: female enbodiment and feminist theory*. Columbia University Press, pp. 15–41.

Martin, R.A., 2006. *The Psychology of Humor: An Integrative Approach*, Elsevier.

Massimi, M. et al., 2011. Matters of Life and Death: Locating the End of Life in Lifespan-Oriented HCI Research. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 987–996.

Massimi, M., Dimond, J.P. & Le Dantec, C.A., 2012. Finding a New Normal: The Role of Technology in Life Disruptions. In *Proc. of CSCW 2012*. pp. 719–728.

Maternik, M., Krzeminska, K. & Zurowska, A., 2015. The management of childhood urinary incontinence. *Pediatr Nephrol*, 30(41).

Mathias, Z. & Harcourt, D., 2013. Dating and intimate relationships of women with below-knee amputation: an exploratory study. *Disability and rehabilitation*, pp.1–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23721496 [Accessed September 2, 2013].

Mattelmäki, T. & Battarbee, K., 2002. Empathy Probes. In *Proc. of Participatory Design Conference (PDC '02)*. pp. 23–25.

Matthews, C.A., 2014. Risk factors for urinary, fecal, or double incontinence in women. *Obstetrics & Ginecology*, 26(5), pp.393–397.

Mazé, R. & Redström, J., 2007. Difficult Forms: Critical Practices of Design and Research. In *Proc. of IASDR'07*. pp. 1–18.

McCarthy, John, and Peter Wright. 2015. *Taking [A]part: The Politics and Aesthetics of Participation in Experience-Centered Design*. Edited by Ken Friedman and Erik Stolterman. The MIT Press.

McCartney, J., The Great Wall of Vagina. Available at: http://www.greatwallofvagina.co.uk/home [Accessed September 24, 2015].

McCreaddie, M. & Payne, S., 2011. Humour in health-care interactions: a risk worth taking. *Health Expectations: An International Journal of Public Participation in Health Care and Health Policy*, 17(3), pp.332–44. Available at: http://www.ncbi.nlm.nih.gov/pubmed/22212380 [Accessed September 3, 2015].

Mcgaw, J.A., 1996. Reconceiving Technology: Why Feminine Technologies Matter. In R. P. Wright, ed. *Gender and Archaeology*. University of Pennsylvania Press, pp. 52–75.

McKean, M. (Center for H. and G.E., 2010. *A Woman-Centered Approach to the U.S. Global Health Initiative*, Center for Health and Gender Equity. USA.

McKie, L., 1996. Women Hearing Men: The Cervical Smear Test and the Social Construction of Sexuality. In J. Holland & L. Adkins, eds. *Sex, Sensibility and the Gendered Body*. British Sociological Association, pp. 120–135.

Meerabeau, L., 1999. The management of embarrassment and sexuality in health care. *Journal of Advanced Nursing*, 29(6), pp.1507–1513.

Meyer, J., Lee, Y.S., Siek, K., et al., 2012. Technologies for Well-Being : Opportunities and Challenges for HCI. In *Proc. of NordiCHI 2012*.

Meyer, J., Lee, Y.S. & Siek, K., 2012. Wellness Interventions and HCI: Theory, Practice, and Technology. *SIGHIT*, 2(2), pp.51–53.

Milligan, C. & Wiles, J., 2010. Landscapes of care. *Progress in Human Geography*, 34(6), pp.736–754. Available at: http://phg.sagepub.com/cgi/doi/10.1177/0309132510364556 [Accessed September 2, 2013].

Minna, kGoal. Available at: http://www.minnalife.com/products/kgoal. [Accessed September 2, 2016].

Moncur, W., 2013. The emotional wellbeing of researchers: considerations for practice. In Proc. of *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. pp. 1883–1890.

Moraes, R.M. et al., 2006. A Virtual Reality Based Simulator for Gynecologic Exam Training. In *Information Technology Based Higher Education and Training (ITHET '06)*. pp. 786–791.

Morgen, S., 2002. *Into Our Own Hands: The Women's Health Movement in the United States, 1969-1990*, Rutgers University Press.

Morin PT, M. et al., 2014. Morphometry of the Pelvic Floor Muscles in Women With and Without Provoked Vestibulodynia Using 4D Ultrasound. *Sexual Medicine*, 11(3), pp.776–785.

Munch, S., 2004. Gender-Biased Diagnosing of Women's Medical Complaints: Contributions of Feminist Thought, 1970 – 1995. *Women & Health*, 40(1), pp.101–121.

Munch, S., 2006. The Women's Health Movement. *Social Work in Health Care*, 43(1), pp.17–32.

Murphy, M., 2010. Immodest Witnessing: The Epistemology of Vaginal Self-Examination in the U.S. Feminist Self-Help Movement. *Feminist Studies*, 30(1), pp.115–147.

Naranjo-Huebl, L., 1995. From peek-a-boo to sarcasm: women's humor as a means of both connection and resistance. *Feminism and Nonviolence Studies Association, Inc.*

Neustaedter, C. & Greenberg, S., 2012. Intimacy in long-distance relationships over video chat. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. Austin, Texas, USA: ACM Press, p. 753. Available at: http://dl.acm.org/citation.cfm?doid=2207676.2207785.

NextGen, 2016. NextGen Jane. Available at: http://www.nextgenjane.com/ [Accessed September 15, 2016].

NHS, Prostate problems. Available at: http://www.nhs.uk/Conditions/Prostate-disease/Pages/Introduction.aspx [Accessed March 8, 2016a].

NHS, 2013. Squeezy. Available at: http://www.squeezyapp.co.uk/ [Accessed January 6, 2016].

NHS, The NHS in England. Available at: http://www.nhs.uk/NHSEngland/thenhs/about/Pages/nhsstructure.aspx [Accessed September 16, 2016b].

Ni, T., Karlson, A.K. & Wigdor, D., 2011. AnatOnMe : Facilitating Doctor-Patient Communication Using a Projection-Based Handheld Device. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. pp. 3333–3342.

NICE, 2015. *NICE Quality Standards: Urinary incontinence in women*. UK.

Niedderer, K., 2007. Mapping the Meaning of Knowledge in Design Research. *Design Research Quarterly*, 2:2(April), pp.5–14.

Norooz, L. et al., 2015. BodyVis: A New Approach to Body Learning Through Wearable Sensing and Visualization. In *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '15)*.

Norooz, L. & Froehlich, J., 2013. Exploring early designs for teaching anatomy and physiology to children using wearable e-textiles. In *Proc. of IDC 2013*. New York, New York, USA: ACM Press, pp. 577–580. Available at: http://dl.acm.org/citation.cfm?doid=2485760.2485869.

Nussbaum, M., 2000. Women's Capabilities and Social Justice. *Journal of Human Development*, 1(2), pp.29–54.

O'Brien, S. & Mueller, F. "Floyd," 2006. Holding hands over a distance: technology probes in an intimate, mobile context. In *Proc. of OZCHI 2006*. pp. 293–296.

Oudshoorn, N., Saetnan, A.R. & Lie, M., 2002. On Gender and Things: Reflections on an Exhibition on Gendered Artifacts. *Women's Studies International Forum*, 25(4), pp.471–483.

Peake, S. & Manderson, L., 2008a. The Constraints of a Normal Life : The Management of Urinary Incontinence by Middle Aged Women. *Women & Health*, (January 2013), pp.37–41.

Peake, S. & Manderson, L., 2008b. The Constraints of a Normal Life : The Management of Urinary Incontinence by Middle Aged Women The Constraints of a Normal Life : The Management of Urinary Incontinence by Middle Aged Women. *Women & Health*, (January 2013), pp.37–41.

Peake, S., Manderson, L. & Potts, H., 1999. "Part and parcel of being a woman": female urinary incontinence and constructions of control. *Medical Anthropology Quarterly*, 13(3), pp.267–85. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10509310.

Peer, A. et al., 2013. Exploring the Representation of Women Perspectives in Technologies. In *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*.

Peterman, A. & Johnson, K., 2009. Incontinence and trauma: sexual violence, female genital cutting and proxy measures of gynecological fistula. *Soc Science Med*, 5(68), pp.971–9.

Peyton, T. et al., 2014. “Every pregnancy is different”: Designing mHealth interventions for the pregnancy ecology. In *Proc. of Designing Interactive Systems* (*DIS ’14)*. pp. 577–586.

Pierce, J. et al., 2015. Expanding and Refining Design and Criticality in HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI ’15)*. pp. 2083–2092.

Pierce, J., 2014. On the presentation and production of design research artifacts in HCI. In *Proc. DIS ’14*. New York, New York, USA: ACM Press, pp. 735–744. Available at: http://dl.acm.org/citation.cfm?doid=2598510.2598525.

Prado de O. Martins, L., 2014. Privilege and Oppression: Towards a Feminist Speculative Design. In Proc. of *Design Research Society (DRS 2014)*.

Prager, K.J., 1995. *The Psychology of Intimacy* The Guilford Press, ed., New York, New York, USA.

Profita, H. et al., 2013. Don’t Mind Me Touching My Wrist: A Case Study of Interacting with On-Body Technology in Public Social Acceptability of Wearable Technology. In *Proc. of ISWC 2013*. pp. 89–96.

Qiu, K. et al., 2013. A curriculum for teaching computer science through computational textiles. In *Proc. of IDC ’13*. New York, New York, USA: ACM Press, pp. 20–27. Available at: http://dl.acm.org/citation.cfm?doid=2485760.2485787.

Rabe, T. & Wolf, H.C., 2012. *Fertility Control - Update and Trends*, Springer.

Ramachandran, D., Goswami, V. & Canny, J., 2010. Research and reality: using mobile messages to promote maternal health in rural India. In *4th ACM/IEEE International Conference on Information and Communication Technologies and Development (ICTD ’10)*.

Ramsay, S. & Rockwell, G., 2012. Developing Things: Notes toward an Epistemology of Building in the Digital Humanities. *Debates in the digital humanities*.

Rasmussen, M.K. & Petersen, M.G., 2011. Re-scripting interactive artefacts with feminine values. In *Proc. of DPPI 2011*.

Ratto, M., 2011. Critical Making: Conceptual and Material Studies in Technology and Social Life. *The Information Society: An International Journal*, 27(4), pp.252–260.

RCA, The Great British Public Toilet Map. *The Helen Hamlyn Centre for Design*. Available at: http://greatbritishpublictoiletmap.rca.ac.uk/ [Accessed September 24, 2015].

Reddy, S., Dangor, A. & Jenna, B., 2009. *Body Mapping as a Participatory Entertainment Education Tool in Helping Youth Learn about Conflict Resolution*, University of KwaZulu-Natal, Howard College, South Africa.

Rode, J.A., 2011. A theoretical agenda for feminist HCI. *Interacting with Computers*, 23(5), pp.393–400. Available at: http://dx.doi.org/10.1016/j.intcom.2011.04.005.

Roe, B. & May, C., 1999. Incontinence and sexuality: findings from a qualitative perspective. *Journal of Advanced Nursing*, 30(3), pp.573–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10499213.

Rosner, D.K. et al., 2016a. Out of Time, Out of Place: Reflections on Design Workshops as a Research Method. In *Proc. of CSCW 2016*. pp. 1131–1141.

Rossmann, J.S., 2008. Built to Spec ? The vaginal speculum as a case study of inadequate design. *Ambidextrous*, pp.47–49.

Sahin, M.K. et al., 2014. Women's Perceptions and Attitudes about Cervical Cancer in Turkey: Kato's Device as an Alternative to the Pap Smear. *Asian Pacific Journal Cancer Prevention*, 15, pp.905–910.

Sandelowski, M., 2000. "This Most Dangerous Instrument": Propriety, Power, and the Vaginal Speculum. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, 29(1), pp.73–82.

Scholl, J.C., 2007. The Use of Humor to Promote Patient- centered Care. *Journal of Applied Communication Research*, 35(2), pp.156–176. Available at: http://www.tandfonline.com/doi/abs/10.1080/00909880701262658 [Accessed September 5, 2015].

Schover, L.R., 1991. The impact of breast cancer on sexuality, body image, and intimate relationships. *CA: A Cancer Journal for Clinicians*, 41(2), pp.112–120.

Sensoria, Sensoria. Available at: http://www.sensoriafitness.com/ [Accessed September 16, 2016].

Shahaduzzaman & Chowdhury, M.R., 1998. Exploring women's perceptions of reproduction through body mapping. *Medische Antropologie*, 10(1).

Shildrick, M., 1997. *Leaky Bodies and Boundaries: Feminism, Postmodernism and (Bio)Ethics*, London: Routledge.

Simonis, M., 2015. What's normal, anyway? GPs should discourage women from unnecessary genital surgery. *The Conversation*. Available at: https://theconversation.com/whats-normal-anyway-gps-should-discourage-women-from-unnecessary-genital-surgery-45650 [Accessed May 4, 2016].

Singh, S. et al., 2009. *Abortion Worldwide: A Decade of Uneven Progress*, New York, New York, USA.

Skeels, M.M. et al., 2010. Catalyzing social support for breast cancer patients. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '10)*. pp. 173–182.

Smyth, L., 2008. Gendered Spaces and Intimate Citizenship: The Case of Breastfeeding. *European Journal of Women's Studies*, 15(2), pp.83–99. Available at: http://ejw.sagepub.com/cgi/doi/10.1177/1350506808090305 [Accessed August 13, 2013].

Solomon, J., 2007. *"Living with X" A Body Mapping Journey in the time of HIV and AIDS*, REPSSI, South Africa.

Sputniko, Menstruation Machine - Takashi's Take (2010). Available at: http://www.sputniko.com/?p=91600.

Stawarz, K., Cox, A.L. & Blandford, A., 2014. Don't forget your pill!: designing effective medication reminder apps that support users' daily routines. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. pp. 2269–2278.

Steinhardt, S.B. et al., 2015. Feminism and Feminist Approaches in Social Computing. In *Workshop CSCW'15 Companion, March 14–18, 2015, Vancouver, BC, Canada*. pp. 303–308.

Storni, C., 2015. A Personal Perspective on Research Through Design. *Interactions*, pp.74–76.

Sundbom, C. et al., 2015. The Andro-Chair: Designing the Unthinkable-Men's Right to Women's Experiences in Gynaecology. In *Nordes 2015*.

Suvilehto, J.T. et al., 2015. Topography of social touching depends on emotional bonds between humans. *PNAS, Proceedings of the National Academy of Sciences USA*, 112(45).

Svanaes, D., 2013. Interaction Design for and with the Lived Body : Some Implications of Merleau-Ponty's Phenomenology. *ToCHI*, 20(1), pp.1–30.

The Angelou Centre, 2016. The Angelou Centre. Available at: http://angelou-centre.org.uk/ [Accessed February 15, 2016].

Thieme, A. et al., 2013. Enabling Empathy in Health and Care: Design Methods and Challenges. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*.

Thieme, A. et al., 2011. Lovers' box: Designing for reflection within romantic relationships. *International Journal of Human-Computer Studies*, 69(5), pp.283–297. Available at: http://linkinghub.elsevier.com/retrieve/pii/S1071581910001540 [Accessed September 17, 2013].

Thomas, C., 1993. De-Constructing Concepts of Care. *Sociology*, 27(4), pp.649–669. Available at: http://soc.sagepub.com/cgi/doi/10.1177/0038038593027004006 [Accessed September 2, 2013].

Thomas, F. & Aggleton, P., 2016. School-Based Sex and Relationships Education: Current Knowledge and Emerging Themes. In V. Sundaram & H. Sauntson, eds. *Global Perspectives and Key Debates in Sex and Relationships Education: Addressing Issues of Gender, Sexuality, Plurality and Power*. London: Palgrave Macmillan UK, pp. 13–29. Available at: http://dx.doi.org/10.1057/9781137500229_2.

Tinker, A., Finn, K. & Epp, J., 2000. *Improving Women's Health: Issues and Interventions*, The International Bank for Reconstruction and Development/The World Bank.

Toma, C.L. & Choi, M., 2016. Mobile Media Matters: Media Use and Relationship Satisfaction among Geographically Close Dating Couples. In *Proc. of CSCW 2016*. pp. 394–404.

Twigg, J., 2000. Carework as a form of bodywork. *Ageing and Society*, 20(4), pp.389–411. Available at: http://www.journals.cambridge.org/abstract_S0144686X99007801.

Twigg, J., 2004. The body, gender, and age: Feminist insights in social gerontology. *Journal of Aging Studies*, 18(1), pp.59–73. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0890406503000926 [Accessed September 2, 2013].

Underwood, H., Sterling, S.R. & Bennett, J.K., 2013. The PartoPen in practice: evaluating the impact of digital pen technology on maternal health in Kenya. In *Proc. of Sixth International Conference on Information and Communication Technologies and Development (ICTD '13)*. pp. 274–283.

Valois, R.F. et al., 2010. Changing Health Behavior in Youth. *American Journal of Health Education*, 41(3), pp.134–138. Available at: http://www.tandfonline.com/doi/abs/10.1080/19325037.2010.10598854 [Accessed September 10, 2013].

Vitis, L. & Gilmour, F., 2016. Dick pics on blast: A woman's resistance to online sexual harassment using humour, art and Instagram. *Crime Media Culture*, pp.1–21.

Vrticka, P., Black, J.M. & Reiss, A.L., 2013. The neural basis of humour processing. *Nature*, 14(12), pp.860–868. Available at: http://dx.doi.org/10.1038/nrn3566.

Wajcman, J., 2010. Feminist theories of technology. *Cambridge Journal of Economics*, 34, pp.143–152.

Ward, T. & Whittick, J., 2011. Intimate and Personal Care Guidance: Educational and Social Care Settings.

Wardrope, A., 2015. Medicalization and epistemic injustice. *Medicine, Health Care and Philosophy*, pp.341–352. Available at: http://dx.doi.org/10.1007/s11019-014-9608-3.

Weibert, A. et al., 2014. Sewing Interest in E-Textiles: Analyzing Making from a Gendered Perspective. In *Proc. of DIS '14*. pp. 15–24.

Weitz, R. & Kwan, S., 2014. *The Politics of Women's Bodies*, Oxford University Press.

WHO, 2016a. Defining sexual health. *World Health Organization*. Available at: http://www.who.int/reproductivehealth/topics/sexual_health/sh_definitions/en/index.html [Accessed September 16, 2016].

WHO, 2016b. Women's health. *World Health Organization*. Available at: http://www.who.int/topics/womens_health/en/ [Accessed September 3, 2016].

Wienand, A., 2006. *An Evaluation of Body Mapping as a Potential HIV/AIDS Educational Tool*, Centre for Social Science Research.

Wilde, D., 2012. hipDisk: Experiencing the Value of Ungainly, Embodied, Performative, Fun. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. pp. 979–982.

Wilde, D., 2014. hipDisk: Using sound to encourage physical extension, exploring humour in interface design. *International Journal of Performance Arts and Digital Media*, (4:1), pp.7–26.

Wilde, D., Schiphorst, T. & Klooster, S., 2011. Move to Design/Design to Move : A Conversation About Designing for the Body. *Interactions*, pp.22–27.

Women's Health Care Physicians, 2011. Health Care for Transgender Individuals. *The American College of Obstetricians and Gynecologists*, Number 512.

World Bank, 2015. Population, female (% of total). *The World Bank*. Available at: http://data.worldbank.org/indicator/SP.POP.TOTL.FE.ZS [Accessed August 11, 2016].

Wright, D. et al., 2005. Speculum "self-insertion": a pilot study. *Journal of Clinical Nursing*, (14), pp.1098–1111.

Wright, P. & McCarthy, J., 2008. Empathy and experience in HCI. In *Proc. of ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '08)*. New York, New York, USA: ACM Press, p. 637. Available at: http://portal.acm.org/citation.cfm?doid=1357054.1357156.

Wright, P. & McCarthy, J., 2010. *Experience Centered Design*, Morgan & Claypool Publishers.

Yates-doerr, E. & Carney, M.A., 2015. Demedicalizing Health: The Kitchen as a Site of Care. *Medical Anthropology*, 9740(October).

Young, I.M., 1990. *Justice and the Politics of Difference*, Princeton University Press.

Young, I.M., 2005. *On Female Body Experience* Studies in. C. Calhoun, ed., Oxford University Press.

Yu, Y. & Nam, T., 2014. Let's Giggle! : Design Principles for Humorous Products. In *Proc. of DIS '14*. pp. 275–284.

Zablotny, A., 2014. *Schoolgirls' Experience of Menstruation as Expressed through Body Mapping in a Quasi-Rural South African Village*.

Ziegler, J.B., 1998. Use of humour in medical teaching. *Medical Teacher*, 20(4), pp.341–348. Available at: http://www.tandfonline.com/doi/full/10.1080/01421599880779 [Accessed September 3, 2015].

Zimmerman, J., Forlizzi, J. & Evenson, S., 2007. Research Through Design as a Method for Interaction Design Research in HCI. In *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI '07)*. pp. 493–502.

APPENDICES: Chapters 5, 6 & 7

APPENDIX | Chapter 5. Intimate Care Work

(Accompanies Chapter 5)

• Example of hand-written field notes

want to be perfect after ↖ problem

Small prolapse more than 50% women have it, but doesn't affect daily life.

II. leakage → little or more — asian heritage — south asian well taken care during nose
few years same urge
symptoms stress inc. - flow normally
causes ↓ - no blood or pain
pelvic floor weakness Sit on toilet / bowels ok 5 children one C
↓ no surgery health ok no meds
teach how to exercise pfm show model explain 2,3 week back

sitting straight, edge chair - start back passage (tight / relax) → back and
pulling vagina inside of you, relax. not holding breath.
tummy goes in squeeze, hold, relax

E gives leaflets — if count out ~~loud~~ loud → helps not holding
— if doing it right, no one • 3 sets/day am, lunch, pm breath
should notice that you're doing it

consent
surgery
feeling of no control

muscle — takes 3 months to see any improv min.
- anticipatory muscle . can be a lazy muscle
automatic

gene-based diagnosis
advances in molecular

genetic + collagen + incontinence
tissue →

props
paper
clean in between with some gel?
gloves
towel
gel

ultrasound - 5 mins x12 sessions

burden of empowerment

III. midwife girl veiled young
28 wks 1st bb
due mid august lower pain front/can't walk longer thirty mins - pain in the back
walk long distances - classes & house
college

exercise: hands on bed, standing
E sits behind
lower back & pelvis touch
. lift leg left/right touch around waist
sides
2. pelvis is straight
lay down - legs straight, lift up

. back & pelvis
lower back, underneath bump + front

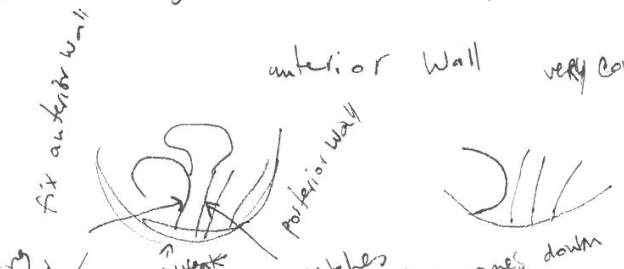
shows tummy muscles exercises
give support to back
- kitchen bench ex:
belly button back to spine, relax
hold, squeeze, -

IV. ultrasound perineum

towel covering area, E prepares device puts gloves thumb moving
talk about weather, light on top, legs spread, ~~E~~ minds
hurts a bit, last time Tuesday, less touch, period, scar spd during pregnancy more sensitive,

w/ bimanual exame can determine pfm strength
advise back to gp + recommend surgery

anterior wall very common



10 x 10 faster

relation to colagen → genetic and incontinence

18 weeks

waiting time from GP to other specialities

Labour party

acupuncture: pain control — study 1st baby, LTW 20-30 weeks

③ pain

exercises, board getting worst — back to toe foot loose sensation (left side)
belt sciatic nerve 21 weeks
no difference
just going to toilet
heart murmur from 1st pregnancy
hydrotherapy improve stability
GP doctor painkillers codine
check form UTI
exercising vs painkillers

④ ultrasound — have seen this patient 1 time before. Had tear, comes in for a quick ultrasound.
talks they talk about the weather, driving, sun, living by the sea, Bay Promenade, dogs, ...
→ stress and urge march 1st time 3, which - sick then again → good on medication
* sore in front bladder + might dribble when laughing, etc / urgency is getting better
self-looking - hard to do, see what's going on there. feel cherry
* creases little red skin is broken wipe w/ toilet paper difficult
cherry lump a spot cream should I be so lumpy? wall of womb
cervix → where it should be vagina walls has folds on it that's ok lumps
cream external
- diversity pfme gaggling — short ones help 10 holding 6 weeks 10 fast
might be aged-body labia sclerosis

1. 2. 3.
Community services + child girl 4 months
seen before pelvic floor muscle
prolapse → feel ↔ not as strong
menstrual cycle
back wall of vagina
bulge forwards when cough both sides pfm x 4 day
• grade 3 — last time check again → grade 4 February
- 1 day to maintain -
if pregnant do more regularly
- shouldn't make difference to delivery
after wee 4,5
remembering is the problem
routine like when brushing teeth
gestational diabitis collagen is enhanced inherited factor
big baby
type of tissue
- vaginal cones.
prolapse 2nd baby c-section won't stop it

APPENDIX | Chapter 6. An eTextiles Toolkit

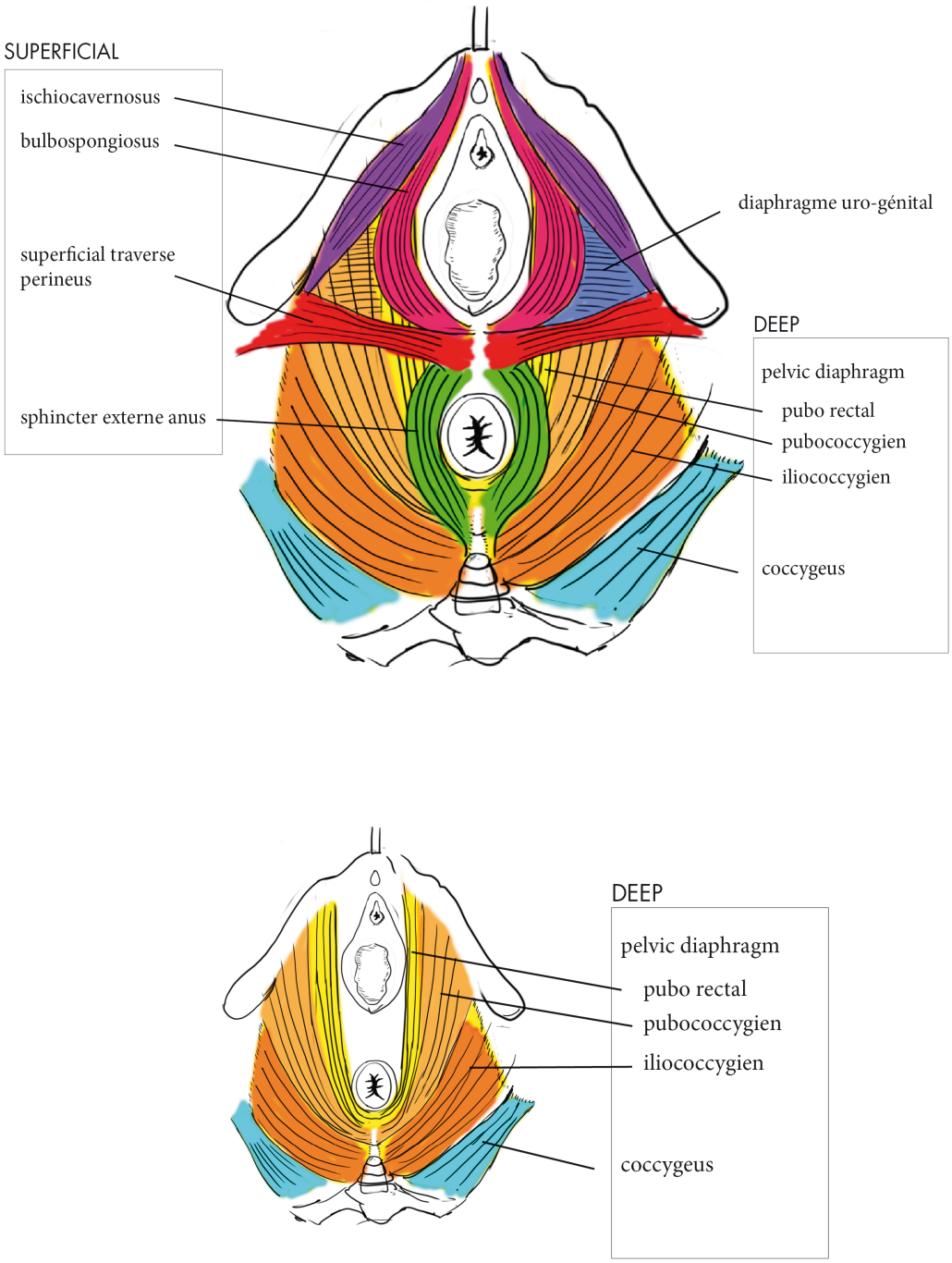
(Accompanies Chapter 6)

• Visual reference and inspiration for the pelvic floor muscles illustration and print.
• Illustration pelvic floor muscles by Sophie Fernandez, original work (sketches).
• Exemplar clothes tag design by Ephrat Seidenberg, original work.
• Handout design by Ephrat Seidenberg, original work.
• Composite of pelvic floor muscles illustration (on transparency ready for photo emulsion).
• Design Toolkit workshops' photos: materials for two workshop activities (Body mapping and DIY wearable e-textiles).
• Pre- and post- pictorial questionnaire (filled in).
• Sample of information sheet and consent form.
• Sample transcription (Workshop with 15s-16s years old at Gosforth Academy, Session 1).

Freddie Robins, *Heart 2 Heart, Kidney Stones, Spots on your Lungs, Paisley Kidney, Lily Livered and Floral Liver*. UK, 1996.

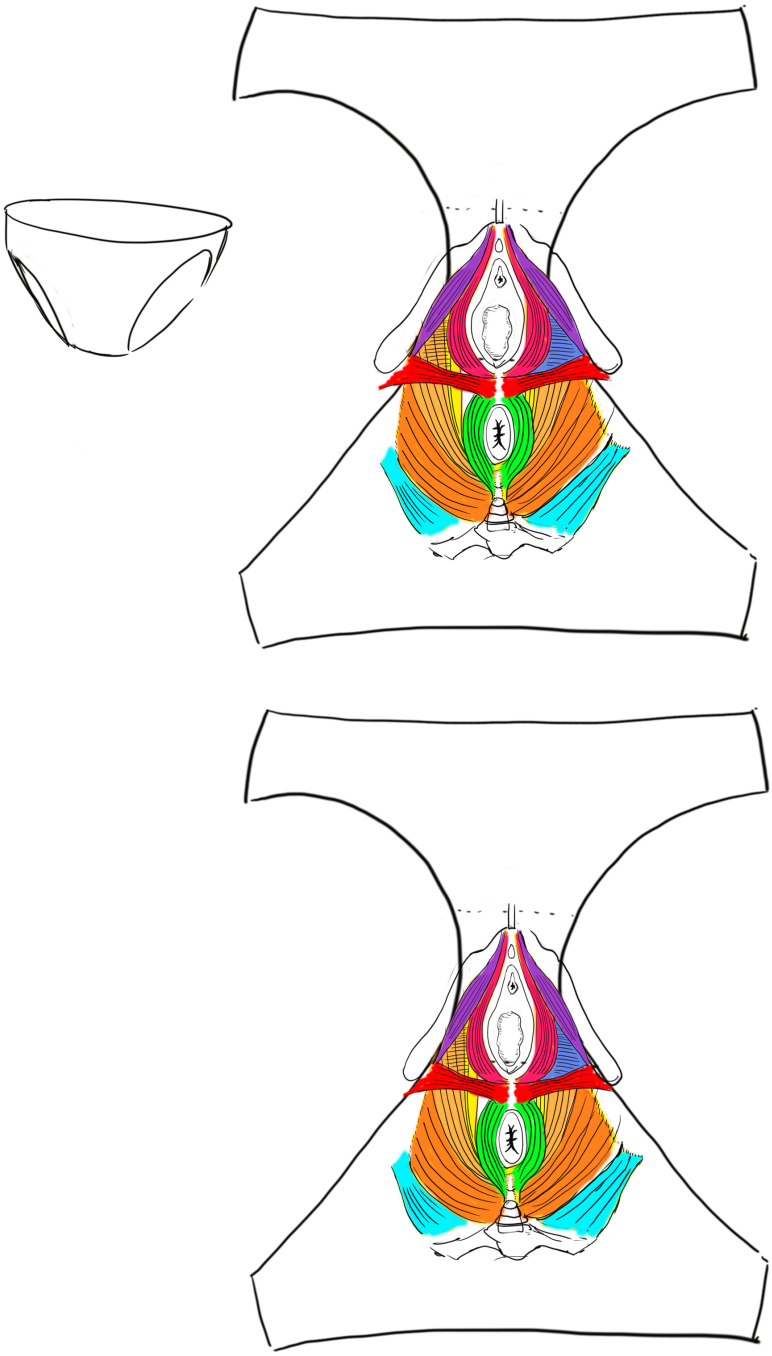
[Screen-printed cotton, wadding,150 × 125 mm – 240 × 920 mm]

Visual reference and inspiration for the pelvic floor muscles illustration and print



Sophie Fernandez, Illustration pelvic floor muscles. 2013.

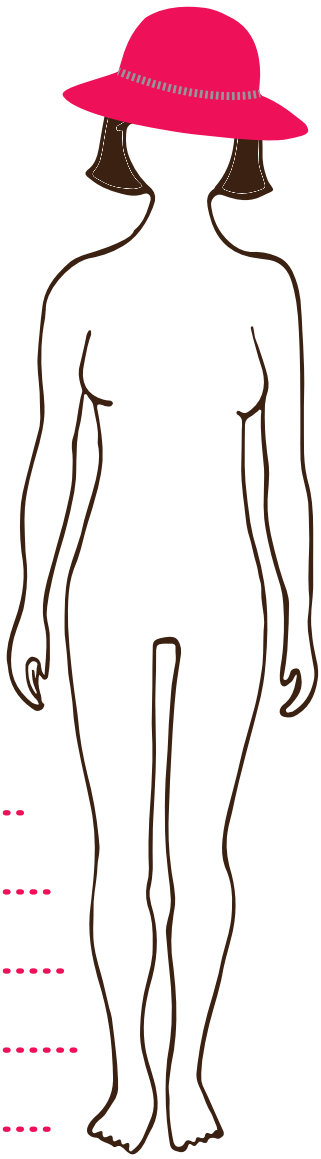
Original Work (Sketch)



Sophie Fernandez, Illustration on knickers. 2013.

Original Work (Concept Sketch)

PELVIC FLOOR FITNESS



Can you indicate in the figure where the pelvic floor muscle is.

Have you learned about the pelvic floor muscle before?

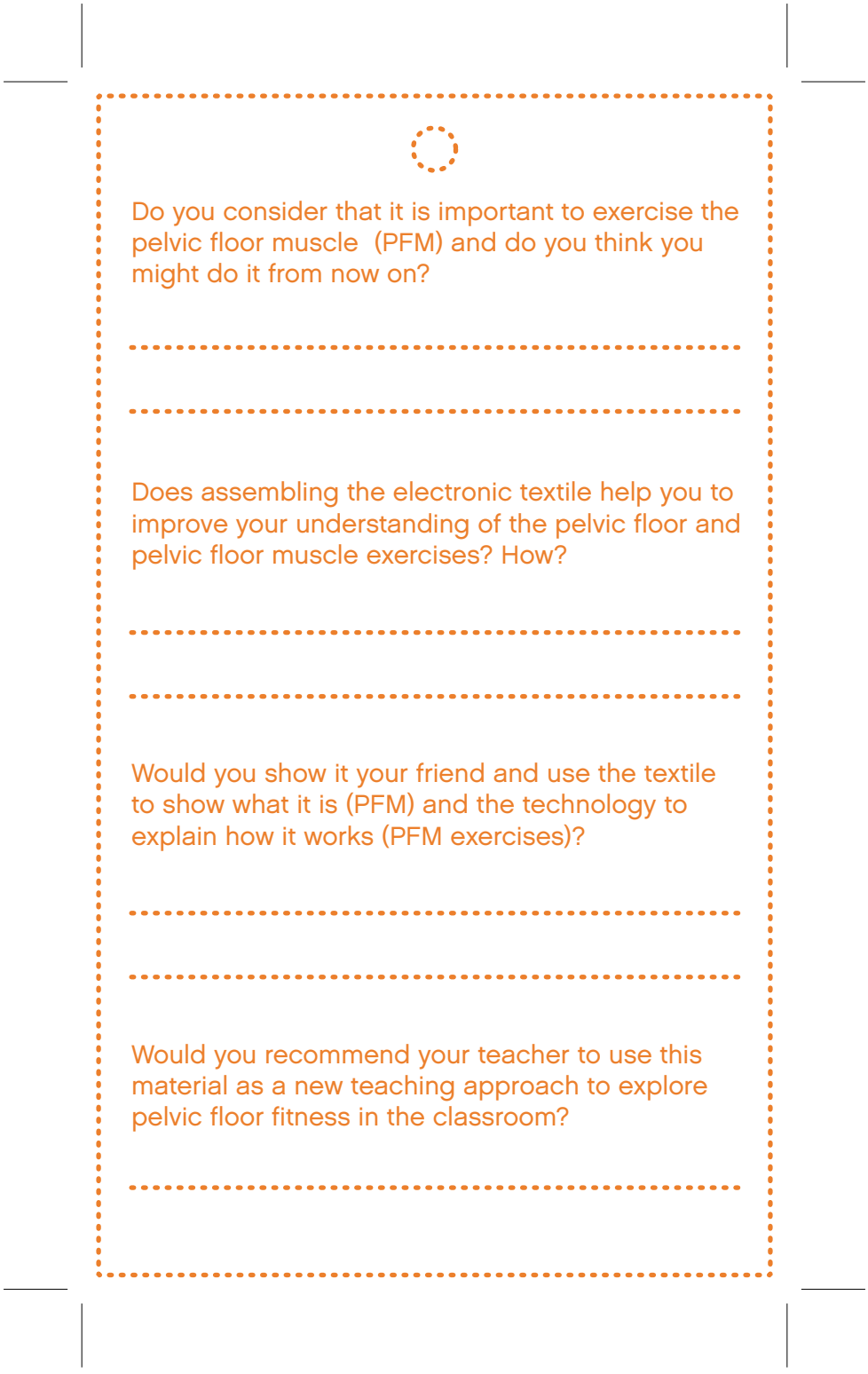
.....

.....

.....

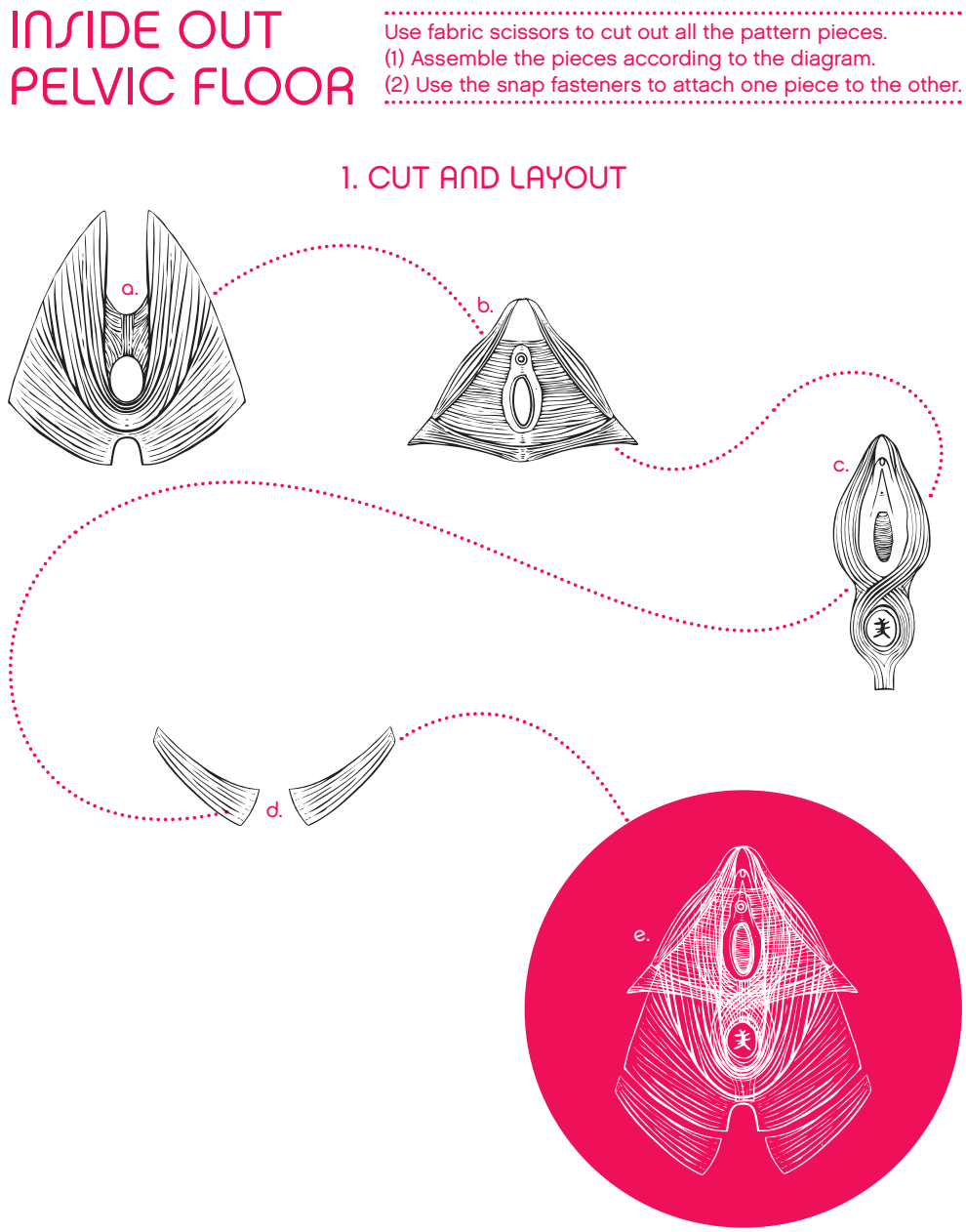
.....

.....



Tag. By Ephrat Seidenberg, 2013.

(Original work)



Handout. By Ephrat Seidenberg, 2013.

(Original work)

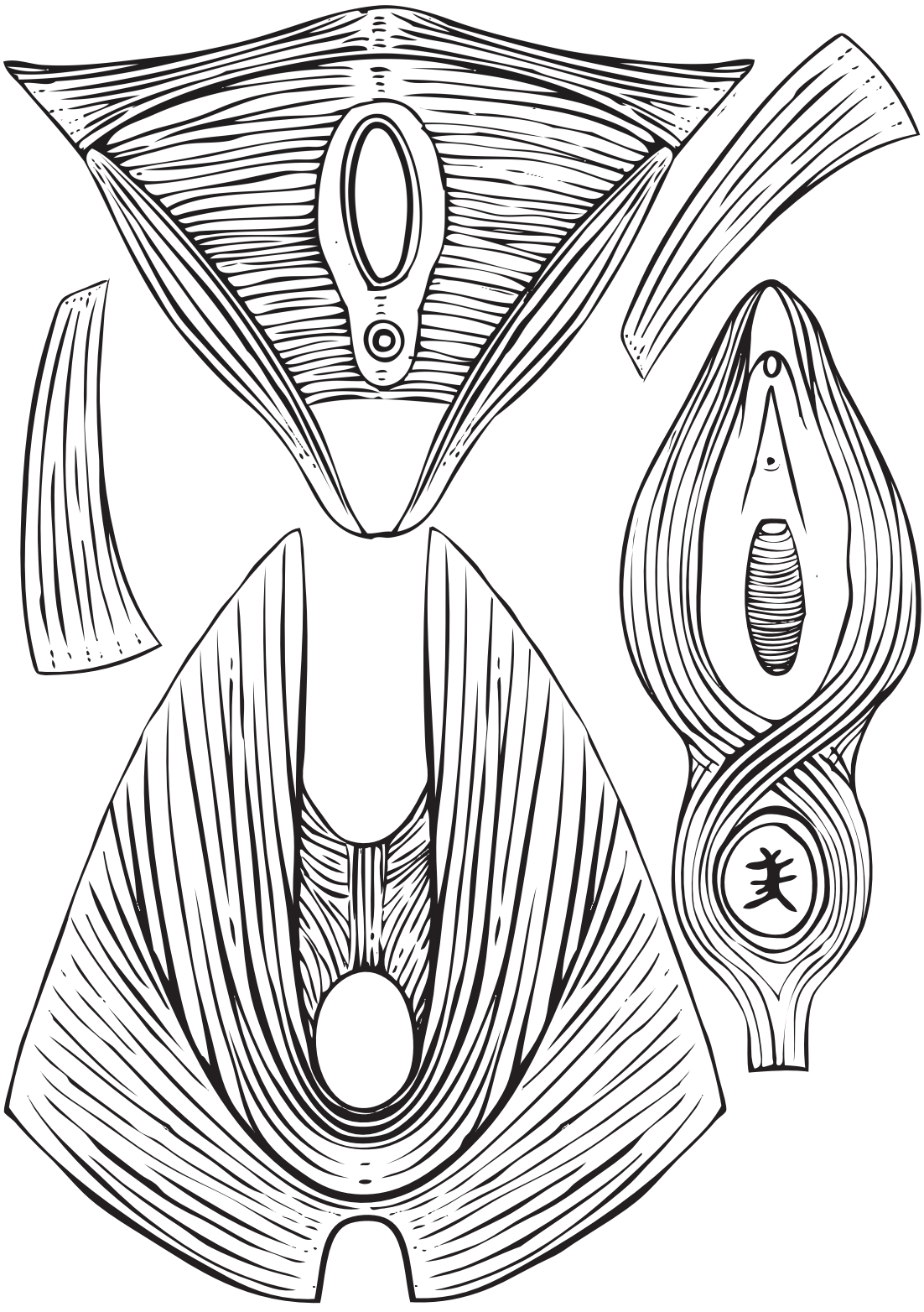


Illustration of pelvic floor muscles (transparency ready for photo emulsion).

Design Toolkit
Materials for two workshop activities: Body mapping and DIY wearable e-textiles.
2013 - 2014

Body mapping: engaging women in the topic of pelvic floor and framed for intimate care with a pair of knickers.

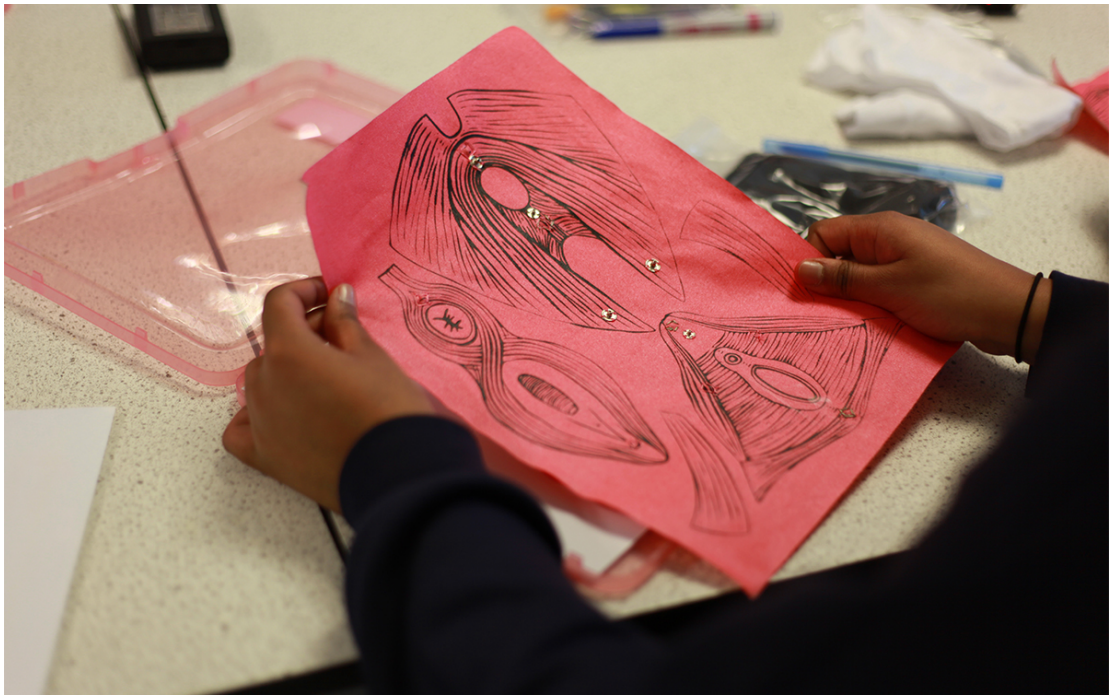
Women were asked to sketch and illustrate their reproductive organs on the fabric material.

Or use a word kit.

To encourage them to use biological language relating to their sexual (and pelvic) organs.

By discussing and drawing what is a sensitive topic that involves female genitalia.

Mapping to the body, on the body.



The second half of the design kit consists of materials to explore the anatomy of the pelvic floor. A fabric print includes an illustration of the pelvic floor muscles.

Laid out flat and ready to cut-out.

Once cut-out, the print is ready to be assembled.

It renders visible the shape of the female pelvic floor.

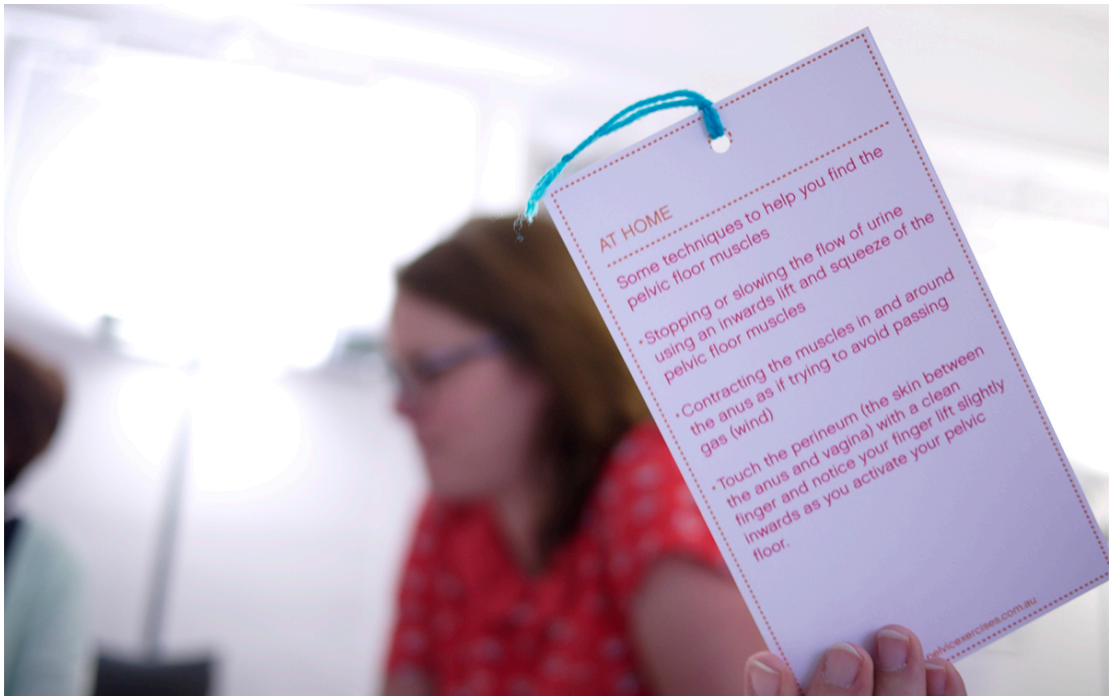
Once constructed, the pelvic floor comprises a functioning eTextile.

It is attached to the knickers via a soft circuit.

And afterwards to a wearable electronics component.

When connected, it supports timing and visualizing a basic pelvic muscle exercise via a sequential timer.

A handout details what the pelvic floor is and how to find it.



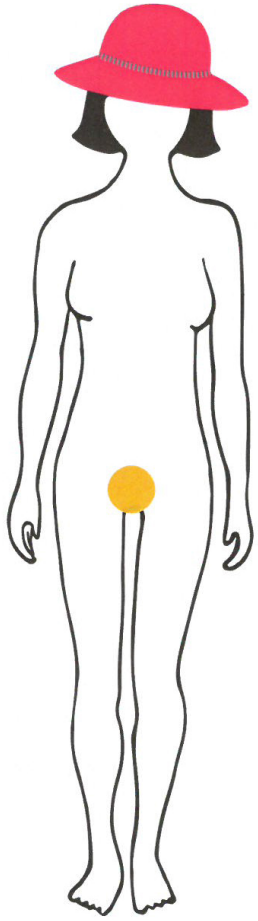
Keep squeezing!

PELVIC FLOOR FITNESS

Can you indicate in the figure where the pelvic floor muscle is?

Have you learned about the pelvic floor muscle before?

Yes ☑ No ☐

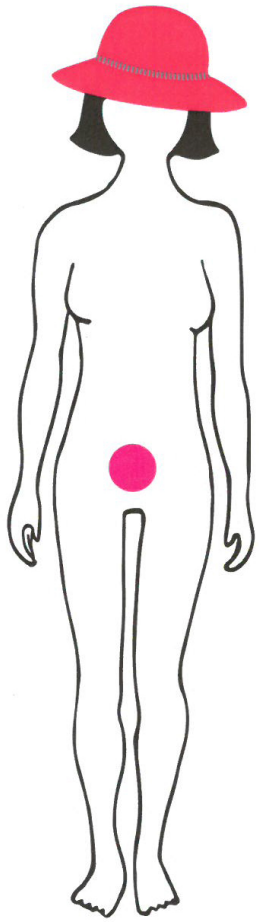


PELVIC FLOOR FITNESS

Can you indicate in the figure where the pelvic floor muscle is?

Have you learned about the pelvic floor muscle before?

Yes ☑ No ☐



Do you think that it is important to exercise the pelvic muscle (PFM)?

Yes ☑ No ☐

Do you think you might do it from now on?

Yes ☑ No ☐

Did assembling the electronic textile help you to improve your understanding of the pelvic floor and pelvic floor muscle exercises?

Yes ☑ No ☐

If yes, how? because i didnt know where all the muscles ~~a~~ were

Would you show the electronic textile to a friend to explain what the PFM is and how PFM exercises work?

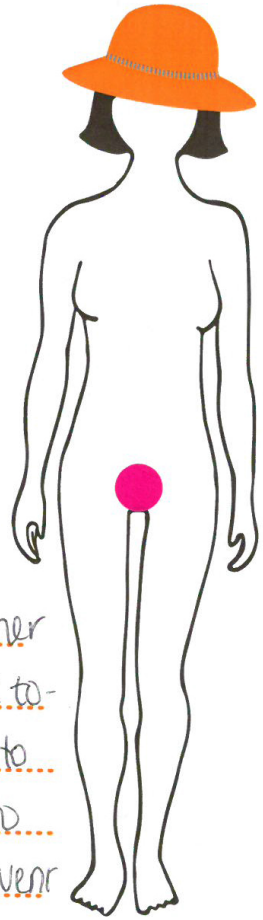
Yes ☑ No ☐

Why/Why Not? because it would also intrest them and let them know where it is.

Would you recommend your teacher to use the electronic textile as a new teaching approach to explore pelvic floor fitness in the classroom?

yes i would.

PELVIC FLOOR FITNESS



Can you indicate in the figure where the pelvic floor muscle is?

What have you learned about the pelvic floor muscle?

its all joint together and they all work together so you need to do the excersises to make sure you prevent leakage.

Encouraging pelvic floor fitness among young women

Student project information sheet

We have developed a design kit that aims to help young people to learn and explore human physiology and anatomy. By doing this, we aim to introduce the role of the pelvic floor muscle in continence prevention and core stability. The **pelvic floor muscles** are the only muscle group in the body capable of giving structural support for the pelvic organs. We think that it might be possible to develop a design kit to help young women understand how important these are for their lifelong wellbeing and also how crucial it is to exercise and keep them healthy. We are asking you if you would like to work with us to help us to evaluate this new tool of body-worn technology that will support new perspectives and new ways of thinking about our bodies in a way that will be fun and playful to learn with.

What will I have to do?
We will come to school at a pre-arranged time and spend two hours with you: this will happen in a workshop environment and we will engage you in hands-on exercises. We will not ask you difficult questions or ask you to discuss personal issues. We are creating a design kit that we would like to make available to all young women, and we will have conversations with you around how and what you think about it in order to help us develop it further.

The workshop will first involve a brief introduction from us about the pelvic floor muscle and its role in maintaining continence. After that, it will involve a collaborative and creative hands-on exercise with art-based materials, such as crayons and fabrics. This will be followed by one final activity that you will undertake individually and which involves a design kit that we will have prepared for you. This design kit includes some fashion patterns and technology that you will plug and play (stitch, Velcro, or iron-glue) to make your piece of clothing. It is a crafting exercise that includes some simple electronic components and textile-computing materials (fabric and threads).

What are the benefits of taking part?
You will be directly involved in the first trial of our design kit of body-worn technology, which we wish to implement for young women across different schools in the future. You will be able to test the technology, tell us exactly what you think of it and how well it works. You will help us with making the design better so that in the future young women like you will also learn about their anatomy and physiology through playing with this technology. We think that the experience of taking part in the study will be enjoyable and interesting.

What information will you collect about me?
We would like to make some video, photographs and sound recordings of the workshop and chats. We do this so that we can go back over your feedback and comments later on. If we don't make the recordings it is difficult to remember exactly what people say and the actions they use to complete the exercise, or show how to make this work more meaningful and engaging.

What will happen to information you collect about me?
Only the people directly involved in the study will see the information we collect. We will use a code instead of your name on all of the information we take for the study. This will help keep your information safe. We will store the recordings we make for the study and the information we collect at Newcastle University. The recordings and information we collect will not be used for any other reason apart from the study. However, we would like to include still images of the activity and workshop in academic publications and presentations related to the project and on our University website (di.ncl.ac.uk). Images that include facial features will be blurred to maintain your anonymity.

Do I have to take part?
No. You do not have to take part in this study. Even if you agree to join in at the start, you can change your mind throughout the duration of the workshop. You do not need to give a reason for not joining in, or for leaving before the end of the workshop. Should you want to withdraw afterwards, you can also do so by informing the researcher. The researcher contact details are provided with this information sheet. This will not affect you in any way now or in the future.

Who else knows about this study?

- Your parents
- Your school

You can talk to any of these people if you have any questions.

Thank you very much for reading this information.

If you have any questions or difficulties before, during or after the workshop please feel free to contact:

Teresa Almeida
Culture Lab, Newcastle University
Email: t.a.almeida@newcastle.ac.uk
Mobile: 07453236834

Madeline Balaam
Culture Lab, Newcastle University
Email: madeline.balaam@newcastle.ac.uk
Phone: 0191 246 4602

This research project has been approved by the Faculty of Science, Agriculture and Engineering Research Ethics Committee, Newcastle University.

Consent form for STUDENTS

I agree to participate in the design workshop: **'Encouraging pelvic floor fitness among young women',** being carried out by Culture Lab, Newcastle University.

- I have read and understood the information sheet about taking part. ☐
- The researcher has answered any questions that I had/ I have no further questions. ☐
- I understand that I will be video and audio recorded, and photographed throughout the duration of the workshop. ☐
- I understand that information about how I engage with the body-worn technology will only be made accessible to the research team. ☐
- I understand that the data collected for this study will be stored in a secure location in Culture Lab at Newcastle University. ☐
- I understand that the data collected for this study will be used only for research purposes. ☐
- I understand that my name will not be used on any documents or in any presentations about the research. ☐
- I understand that I can leave the study at any time without needing to say why. ☐
- If I leave the study this will not affect any services that I receive. ☐

Signature of participant.....

Name (in capitals) …… Date……..

Signature of researcher……

Name (in capitals) ……..Date……..

Please feel free to contact the researcher with any questions:

Teresa Almeida
Culture Lab, Newcastle University
Email: t.a.almeida@newcastle.ac.uk
Mobile: 07453236834

TRANSCRIPTION WORKSHOP 15S-16S

December 10, 2013: Session I

P1: Anna
P2: Beatrice
P3: Carla
P4: Dana
P5: Eliza
P6: Fatima
+ Ko-Le Chen: Assisting (photos)
+ Madeline Balaam: (Observing)
+ Jackie: Teacher (Assisting/Support)

Setting up <setting up audio recorders>
Distribute <clothes tag> explain what to do <collect>

Dana: Miss, you know when you say you know about the pelvic floor muscle before, you know when you came last time and said about the pelvic floor muscle, do we say yes cause we've learned a little bit about it…

Teresa: Ahhh well, sure *(laughs)* I did tell you all about it … so it won't be a surprise what we're going to be doing today… This is a very tricky first question…

Jackie: Stick it on where it is… Where you think it is…

[<Collect>]

Teresa: So, I'm just going to show you a few images, and together with the images I'm going to give you another exercise, and the exercise.. I will ask you to do it in pairs, do it together in groups of 2 and discuss where and what to put where cause it's going to be a… drawing exercise. And I think I also mentioned this the other day…

Beatrice: oh, I know what the exercise is…

Teresa: Oh, you did go online and look…

Beatrice: No, I didn't go online. My auntie told me.

(Laughs)

Teresa: That's good, you asked… Ok, so now… here we go… so, as you've seen in that little tag, we're talking about the pelvic floor and pelvic floor fitness, how to keep our pelvic floor healthy and that's what we'll be talking about today and Thursday. And in doing that, it won't be me just talking, I also be giving you some exercises, and some materials to help you think about it. So this image that you see here (slide 1) it's something that we'll do on Thursday. It will be in that torso, on that mannequin, it will be, we'll be putting something together today and Thursday… and in the end we'll have… something shinny (slide 1, showing led lights). You'll see.

So, the first exercise will be about the pelvic floor and what the pelvic floor is. Which again you might know a little bit about because I told you the other day. But, I also know that you've studied the female reproductive organs, the female sex organs and the first exercise will be to actually sketch, draw, put those organs in… these… little… briefs… (unpacking) that I brought for your to draw on, and you'll do it in groups of 2. Ok? So, you might know where they are, you might remember how they look like or not, it's fine.

Dana: Do you want me to draw a vagina?

(laughs)

Teresa: Yes. Ok. Let's…

Dana: Miss, I don't know… how can you like… draw the organs, if the organs aren't there but are like there, here… on top of the line thing…

Teresa: Well, then… They don't fit you don't…

Dana: Cause the ovaries and stuff are over here and there's a line, and the vagina there.

Jackie: Yeah, you just put the ovaries… there…

Teresa: On the hips…

Dana: On the hips? Ok …

Beatrice: I draw that.

Teresa: So between the 2 of you, you can discuss ok, so where are the ovaries: are they within this space, this body space, or are they outside that body space…. And then you can tell me, if they are. Maybe not all of it fits in here, true. And that's another good thing, you actually know. So, just use these fabric pens and let's see what you can come up with. Because you've learned about it so let's see if you remember what it looks like.

Dana: Basically, there's…

Beatrice There's 2 ovaries..

Dana: Is it?

Beatrice.. the ovaries there… you want to draw them there?

Dana: Can't draw them anyway.. Miss, can you draw the ovaries here? Cause I…

Jackie: I'm not allowed to talk …

Dana: She said yeah..

Eliza: Oh my god, I can't draw this. It's too hard…

Fatima: Does like…

Jackie: I don't know… looks like this.

Fatima: Yeah, so it's like

Teresa: So you mentioned the ovaries, so that's one of the organs that are part of the sex, the reproductive system. Is it? (starting to write on the white board)

Beatrice: Yeah..

Eliza: It's quite hard to draw on these, it's really hard..

Dana: And then it's got like a eggy thing here, and that's where you have the period..

Beatrice: It's meant to be like that..

Anna: I want to draw it nicely

Dana: And the eggs have the DNA thingy so you have to put like a circle in them.

Beatrice: It joins up. This one joins up.

Teresa: Are those ovaries?

Dana: These are the ovaries and that's the little eggy thing that's there, you know, when the (?).. happens. And then, the other holes, that's a thing.. the (?) buttons.

Teresa: Ok. What else is there, do you remember?

Dana: And that's it. Vuvu. *(Laughs)*

Teresa: Yeah, yeah it is. Do you remember any other organs besides the ovaries? Well, and the vagina.

Beatrice: The uterus..

Dana: Like the thing that holds the urine and stuff inside it. What it is called..

Beatrice: You need this. Miss what you told us…

Dana: The uterus. The clit bit.

Jackie: The uterus. The clitoris is part of is, but it's not exactly in the same place as the uterus.

(Laughs)

Jackie: What you call this? The u..

Dana: I know the guy's bladder is… it's on your left, isn't it?

Jackie: It's drawn to the left.. It's actually, your bladder is right in the front of your uterus. Because when you're pregnant the uterus presses on your bladder.

Teresa: So you say the bladder?

Dana: Yeah, I think the bladder…

Beatrice: That's the…

Dana: Miss, you know for twins, do you have like..(?)

Fatima: Twins 2 eggs only. When 1 egg is split in to 2.

Beatrice: Do you like mine one?

Fatima: this is the thing

Beatrice: Draw a few more lines..

Teresa: Ok, so… so far we have: the ovaries, vagina, uterus, .. there's also bladder…

Dana: We say it's the clitoris as well, or is that really not kind of..

Teresa: Yeah, it's also there right.

Dana: Babies… Miss, are you pregnant? [<MB being 8 months pregnant>]

Eliza: Wait, can we finish it? They got a smiley face.

Teresa: Ok, it's getting more and more detailed, what are those?

Beatrice: It's like the thingy… do you know when the penis is inserted and there's that wall?

Teresa: … so they're visualizing someone getting pregnant..?

Dana: It's called the 'hymnus'.. the wall… that piece of material.. I mean, it's not material it's like a skin. You know what 'pop the cherry' is? … you know when you have sex for the first time blood comes out for the first time, isn't it. Cause of the little wall.

Jackie: The hymen.

Beatrice: Is that in the wee hole or the vagina?

Dana: There's no wee hole, there's no wee hole.

Beatrice: There is!

Dana: The wee hole and the vagina is the same thing

(Laughs)

Beatrice: No it's not! Oh my god..

Dana: You only got 2 holes

Beatrice: No, you've got your thingy

Eliza: There's 3 holes in there.

Beatrice: there's a hole there, there's your vagina, there's your bum.

Dana: Is it?

Teresa: Yes. Also, do you know the name of that pee hole?

Beatrice: Wee hole, pee hole, is it?

Teresa: No, do you know the name?

Eliza: It's …

Teresa: I show you (slide)

Dana: Oh my god, Is that 3 holes, so there's 3 holes?

Eliza: Yeah!

Beatrice: How can you think that?

Dana: Oh my god… so can you put it… you know when you have sex… can you put it in the first hole as well?

Eliza: No, it's toooo small

Beatrice: It's sooo small, is it … it doesn't expand, doesn't do anything.

Beatrice: I wanna see like this.

Teresa: I'll show you that.

Beatrice: Make sure it's clean.

(Laughs)

[(Slide) <Pelvic organs>]

Teresa: So you've identified the … vagina, the uterus, the clitoris, the bladder, not necessarily part of the sex organs but they are… the bladder is part of the pelvic organs. Which is what we're talking about today. So… pelvic organs: the organs that

are part of your pelvic floor, and there are 3 openings in your pelvic floor. You've identified all of them, and one of them it is the vagina, the other one the anus, and the other one, the wee hole, which is the urethra. So it's true! There are three holes.

Beatrice: How…

Dana: Can I ask you a question? It's about sex…

Teresa: Yeah, a question about sex..

Dana: It's appropriate, it's appropriate… is it, in healthy terms, like anal sex..

Jackie: I don't think that's what they're talking about.

Dana: Is it unhealthy though?

Jackie: Some people do, some people don't.

Dana: Oh my god…

Jackie: There are risks. Some people do, some people don't. It's a personal choice.

(Sounds on the background)

Eliza: So what's that white thing?

Teresa: What white thing?

Beatrice: Isn't that the vagina lips?

Eliza: Pubic bone… Yeah, that.

Beatrice: This bit… yeah, this bit… I don't even understand what that is...

Eliza: Is that around the bone?

Teresa: it's part of the…

Jackie: It protects your pelvic organs.

Teresa: Exactly.

Beatrice: So you would not call that the vagina, you'd call that…

Jackie: That all there, that's the pubic bone.

Beatrice: But you wouldn't call that the vagina?

Jackie: No, the vagina is the hole.

Beatrice: Not that but you see the vagina area…

Jackie: No, the vagina is the hole.

Beatrice: So what's the all thing called? The all thing around

(Laughs)

Jackie: It's to protect all those organs.

Teresa: Exactly. And that's what we're talking about today actually, is the part that protects all these organs and help keeping all these organs in place.

Beatrice: Can I ask a question?

Teresa: Sure.

Beatrice: Do we have vagina lips whatever, I don't know the right word for it…

Jackie: Labia.

Beatrice: … the flaps

Eliza: The clitoris, inside of it… oh yeah. To protect your…

Beatrice: Why do we have some flaps, those vagina lips…?

(Laughs)

Jackie: It's protective. In a protective way.

Beatrice: To protect what? My wee hole?

(Laughs)

Teresa: … you know now that there are 3 different holes on this pelvic floor, and I'm going to show you what they look like… so if you see it from the …

Beatrice: The top?

Teresa: The bottom

Eliza: Bum hole.

(Laughs)

Teresa: So you see that there are 3 holes

Jackie: So that's like a lady lying back with her legs wide open.

Beatrice: Ah, right ok…

Teresa: But you can see that there's a combination of muscles, so what's beneath the flesh, this combination of something that actually creates the all, that keeps

everything together. And, as you know the muscles … it's something you can stretch it you can... when you exercise, you stretch your muscles... you keep them , that's what keeps them in place all of it. And in talking about the pelvic floor in particular, but you have muscles all over your body that's what… let's you do all this kind of movements.

Beatrice: Is that the… anus? It's really like… big.

Teresa: Yeah. So you see these are the muscles and they're on the base, they form this pelvic floor, and they're there because they help keeping these organs, the pelvic organs, in the right place. So if they're not there, not there and healthy, one of those organs we've identified can go to a place it shouldn't go and then it is, you can have pelvic problems because of that.

Dana: It says it helps with sex, how does it help with sex?

Teresa: So…

Jackie: You want me to talk about it? So, that's the anus, your bum bum (?) your (?) .. comes out, that's your wee urethra where your wee comes out, that's the clitoris, there. This is the vagina where the penis would go in…

Beatrice: That's quite bi… huge…

Jackie: So, when you have a baby all of this gets stretched. Right?

Beatrice: Ahh hhhh ohhh

Jackie: So, when people do that pelvic floor muscle exercises after they had a baby when the man has sex with them it's tight so therefore both of you get pleasure when you have sex because often when you have babies or all this muscle goes all floppy, often your sex life isn't as good, after you had babies.

Beatrice: But then you've got the bum hole.

(Laughs)

Beatrice: Teresa mentioned it.

(Laughs)

Teresa: So now you know… there's 3 different things. It's very important that they're in the right places, and do the right things because if not some of the symptoms for example when they're not doing the right before or after having a baby it's that you can have some leakage… when you're laughing, for example, so you giggle and for some reason, for no apparent reason...

Dana: You wee yourself…

Beatrice: Why does that happen though?

Eliza: Yeah..

Jackie: Cause the muscle is not tight. So the wee comes out because the muscle is not keeping it in place and tight, so you got the leakage.

Beatrice: What's menopause?

Teresa: That's what happens on a later stage…

Jackie: Old women like me when they stop having their periods.

Eliza: Miss, you're not that old!

Beatrice: Ah, I can't wait to stop my periods.

Jackie: You're too old to have babies, so… your period stops. Cause you have no estrogen.

Dana: Does that mean your hormones stop as well? Does that mean you wouldn't have mood swings like we would?

Jackie: Yes, well gradually you get less and less and then you start getting like old lady looking…

((nervous) Laughs)

Teresa: There you go, so some symptoms and some causes... childbirth and then one of the reasons for the pelvic muscle getting... so to help us visualize a little bit better what this pelvic floor is and what pelvic floor muscles are I'm gonna give you something to assemble. And you might remember or not the other day I mentioned that 'd be sewing and all that, but for now is just cutting out and then I prepared all the sewing for you to attach and we'll continue working on that on Thursday and that's what you're gonna attach here. And together with this, so there's one for each one of you, so in that kit, in that folder, you have... so I'm gonna make you work now, gonna make you cut fabric. So what you should be d oing now is cutting out all these different pieces and each one of them represents one muscle, or a combination of muscles. All together they represent your pelvic floor. And when you assemble it, you will have something similar to this image (in handout) the one that you have there... and has homework I'm giving you this (leaflet like) information that tells you again what the pelvic floor is, and how to find your pelvic floor muscles. So you can try it at home. Ok? And then next week, we finish assembling, sorry next Thursday, we finish assembling this pattern and we'll do a little bit more on the exercising the pelvic floor muscles. So a very simple way, sitting here as we are now, and actually make sure that we're keeping our pelvic floor muscles in the right place.

Jackie: Scissors. Do you want me to provide scissors?

Teresa: Oh, I have scissors...

Jackie: So these are all muscles... so that's actually a hole, these are the muscles that keep the hole in the right place.

Dana: A bit weird ah…

Teresa: Yes, so if you think about it, it's not something that you can see ahhh… because it's not in the exterior, it's something that is inside... but now you know where all these different pieces would go…

Dana: So we just cut them?

Teresa: Yeah, just cut around all these different shapes. And you'll see, later they'll be attached, you can see here is that a different…

Beatrice: Each one…

Dana: Attach and make it shine like you said

Teresa: Well, we're going to attach it all in the right places so it looks like a pelvic floor, and then we'll finish it by attaching it to the panties, to the briefs, and... do some exercising… ok?

Eliza: Mm mm

Dana: Miss, you know… does that relate to… you know, when women are pregnant, giving birth, is there some of the poop or some wee that like, when giving birth…

Teresa: You know that you asked me that the other day?

Dana: Did I ask you the same thing?

(Laughs)

Teresa: You're obsessed…

Dana: Obsessed… OK…

(Laughs)

Teresa: That's the thing, you're doing a lot of pressure on your pelvic floor and now you know your pelvic floor has these 3 openings right, from one of them the baby will be coming out, the other one is where your wee comes out, the other one the poop comes out.

Dana: Yeah…

Teresa: So it's very easy when you're 'expelling' a baby that everything else… and that's natural… it happens. … The tighter you pelvic floor is, the less... it will happen, because you know, if there's all that floppiness then it's very easy that...

Dana: I can't wait to be a mum…

Eliza: Teresa, you know these pictures what are you gonna do with it?

Teresa: You mean with this?

Eliza: No, no, no.

Teresa: Oh, the pictures. So the pictures I'm keeping all of them in my computer only, and I'll be using some to... when I do presentations…

Eliza: No faces though.

Teresa: Yeah.

Eliza: Can we see it?

Teresa: Yeah, I can send them to you if you want, I…

Dana: Teresa, what made you interested in this subject, like… in this?

Beatrice: Cause no one is really talking about it.

Teresa: So my project is about health and wellbeing, and I thought women's health could be a good way to start and…

Dana: A topic… it's really interesting…

Teresa: Yeah, this is something that we really don't think about that no one really teaches us in school and you know at some point in our lives it might happen and we wouldn't know or learned something about it…

Dana: I think it's really good, learning things we don't know about… like if you learn about the heart, we learn about the heart every single day… (25')

Teresa: Oh really?

Dana: Yeah, practically every day… so it's nice to like learn something new.

Teresa: Well yeah, it is a very important part of our bodies, and we don't really pay much attention…

Dana: What about men, do they also have the same thing?

Teresa: You also asked me that the other day…

Dana: Did I really asked you the same questions? What's it wrong with..?

Teresa: Its' the same symptoms, basically, it's also related to sexual function. So it's more difficult for them to have an erection, for example… if the pelvic floor muscles are weak…

Dana: Really?

Teresa: Yeah… So if you go to the doctor, either men or women, if you go to the doctor because you have a leakage, it's the same kind of… You brought up (questions about) sex only.

[<Scissors> left handed, right handed… some difficulty with scissors, the conversation continues around being left or right handed.]

Beatrice: Miss, cause I have been doing the exercises all this time…

Teresa: You have? That's good.

(Laughs)

Teresa: So the other day, after I was here, did you go home and ask?

Beatrice: I didn't go like, I told my auntie… Teresa came in and she told us about this and she's like oh yeah because her when she had my cousin she has to do it. And she told me I should start it.

Dana: So does it strength your muscles, like down below?

Teresa: Yeah. Just keeping it as it is, or making it better, yeah.

Beatrice: Should I leave it leave like this or should I cut it like that?

Teresa: Yes, cut that.

Eliza: Did you draw this miss?

Teresa: I… I didn't, someone else did. Someone who is an illustrator, as a profession.

Beatrice: What are these?

Jackie: They're muscles.

Beatrice: So this is the thing?

Teresa: Yes, that's the thing. So now, if you look at the handout… can you actually assemble it together?

Beatrice: Like this?

Teresa: Yeah. So that would be the final image.

Beatrice: So you take A…

Eliza: So which way would it be? This would be the top in there…

Beatrice: B…

Dana: Is that hard?

Jackie: No, don't think so. Is it, It's not gonna fold over again...

Beatrice: Is it like this, Miss?

Jackie: Well, that's your bottom.

Teresa: Mmm, look at the picture again.

Beatrice: Oh, this bit…

Teresa: And think about it as in… all these snaps, all these little, different… they attach in specific places.

Eliza: All together?

Teresa: So you have to find out where… which one attaches to which.

Beatrice: I don't know if the vagina goes first or not…

Eliza: I'm so slow cutting… is it this way, or is it this way?

Jackie: Like a sling, support … we're on about 5 minutes...

Teresa: So for today we just finish cutting, eventually assembling… uau, I see something happening there… and I'll keep everything with me and bring it to you again on Thursday. And we'll finish it.

Eliza: So what do we do now? Where's my flaps gone?

Teresa: What happened, are you missing one muscle?

Beatrice: These go down here… or is it like this, Miss?

Teresa: Ahhh there's just 1 detail there that is not… right.

Jackie: Look at the picture… and look at the 2 at the bottom... look at the picture, is it C, no D? D… look at D.

Beatrice: What about it?

Eliza: This way?

Anna: Yeah, big piece is inside.

Jackie: Turn it around.

Eliza: Is it like this?

Jackie: Other side… swap them over... no, swap them… that's it.

Beatrice: Like this, is that it?

Jackie: There you go, yeah..

Teresa: You got it.

Eliza: Doesn't go in…

Beatrice: Some of them don't click together…

Teresa: If it doesn't go in, if it's not snapping right what do you think, the problem is?

Eliza: It's the wrong way.

Teresa: Ah, ha…

[Conversations on topics of cesarians> stiches> episiotomy]

Jackie: Teresa, we're very close to finishing the lesson.

APPENDIX | Chapter 7. Labella

(Accompanies Chapter 7)

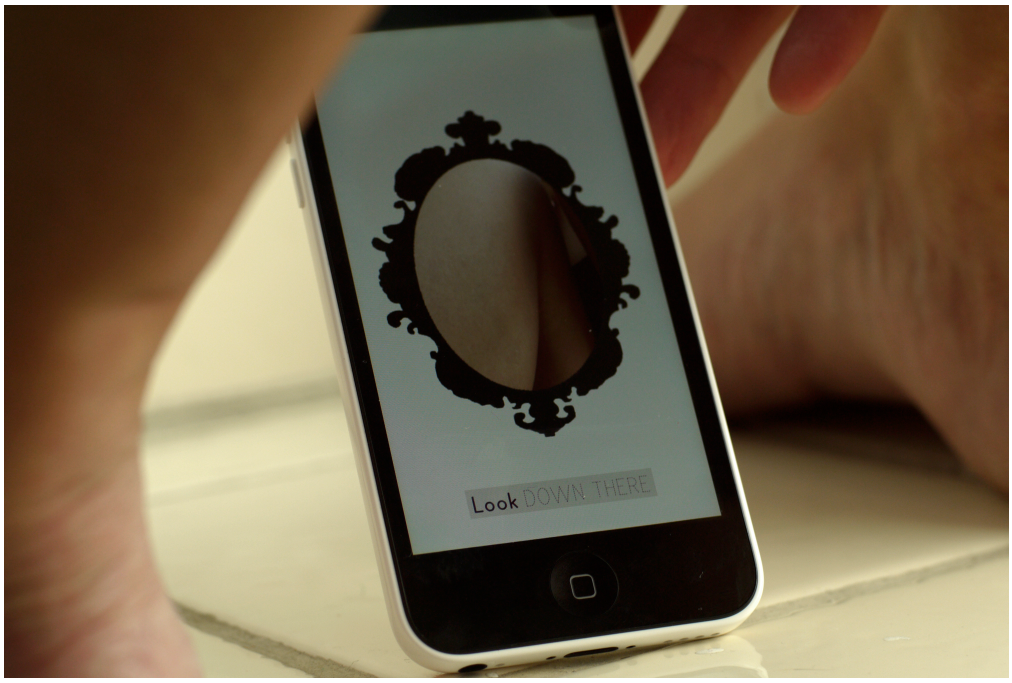
• Labella: Selection of photos and illustrations.

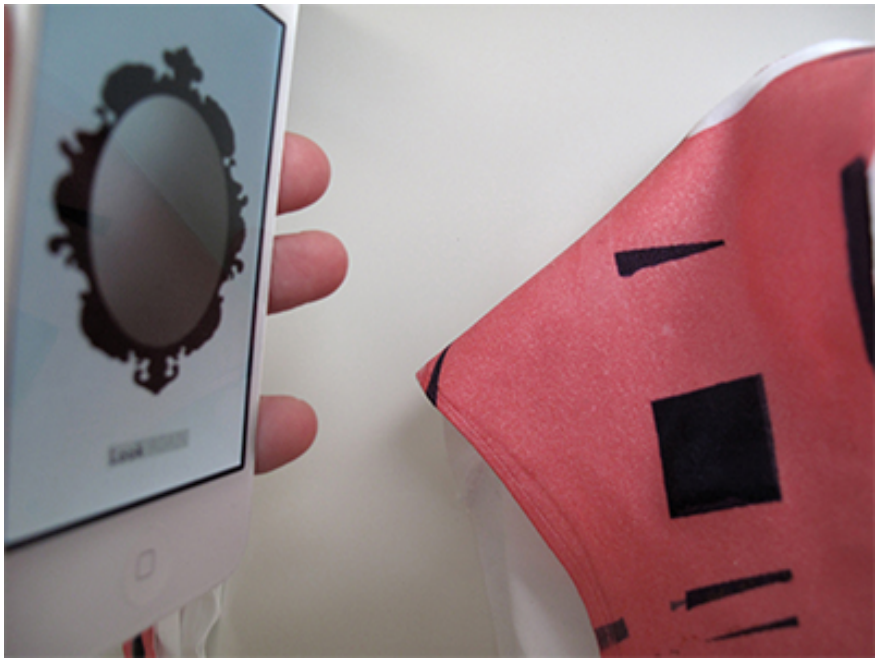
• Labella: Conferences (photos of installation/display).

• Sample Thematic Analysis: Mapping (women only study & study with couples).

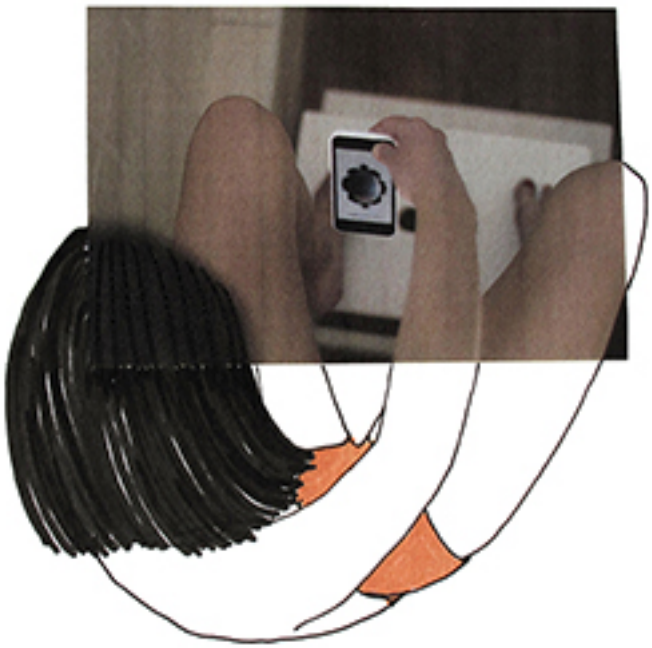
• Interview schedule.

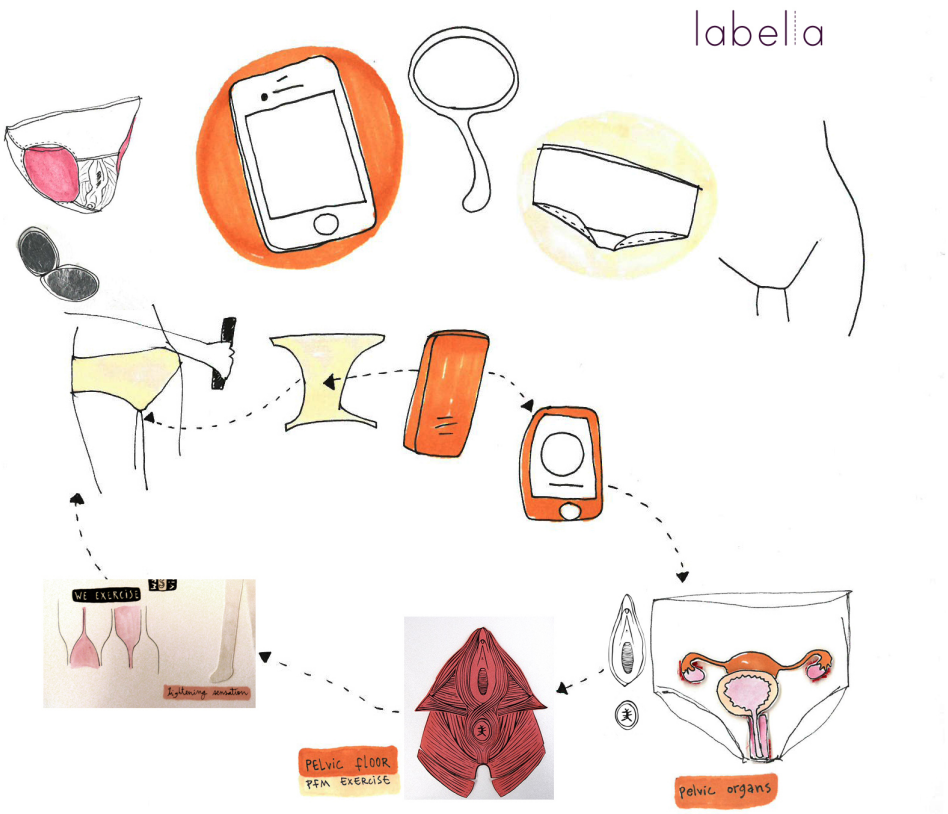
• Sample of information sheet and consent form.


Look DOWN THERE



Illustrations




labella
WE EXERCISE
PELVIC FLOOR
PFM EXERCISE
Pelvic organs

Conferences

Interactions Gallery, British HCI, 2015 (installation).

Interactivity, CHI ’16, San Jose, CA, USA, 2016. (stall).

Physical indignity of looking at yourself

Awkwardness of looking

Feeling self-conscious

Feelings of bodily taboo so strong

Would never think about peeking

avoiding problematic knowledge

Taboo of looking

humour as a facilitator

ON LOOKING

Body as humour

humanizing the illustration

decontextualized weirdness

Phone as mirror

Where and why is the camera 'looking'?

Who is comfortable?

accepting awkward as necessary

other people's taboo, but not mine

looking away others discomfort

distancing uncertainty

legitimate because it's science

vulnerability (judgement by others on disfigurement)

tone of learning

legitimacy of discovering through app

exposing disfigurement

AWKWARD LEARNING

• looking is awkward:

• learning is awkward:

• the body is awkward:

• accepting awkward as necessary: awkward learning as valuable to question the uncanny and a sensible method to be informed

AWKWARD LEARNING

IT'S MY BODY

you should know this stuff, right?

what I know vs what I (think) I should know; what knowledge did labella introduced to me; colloquialisms, awkward metaphors; misinformation about the body ((which Labella helps demystify)

CONSTRUCTIONS OF THE FEMALE BODY

the mystery of the female body: personal histories, how we learn, how Labella makes way for learning;
body as funny, looking is awkward, it also looks awkward

LOOK DOWN THERE

experiencing Labella, phone as mirror; awkwardness of interaction

TRIAL AND ERROR

combining apparel with phone; interaction; find way to work; how does that make you feel;

DECONTEXTUALIZED WEIRDNESS

looking through the mirror; learning from the outside/inside the weirdness of the body

The physicality of the interaction

- the physicality of the interaction
- challenging weirdness as prohibitive
- breaking awkwardness

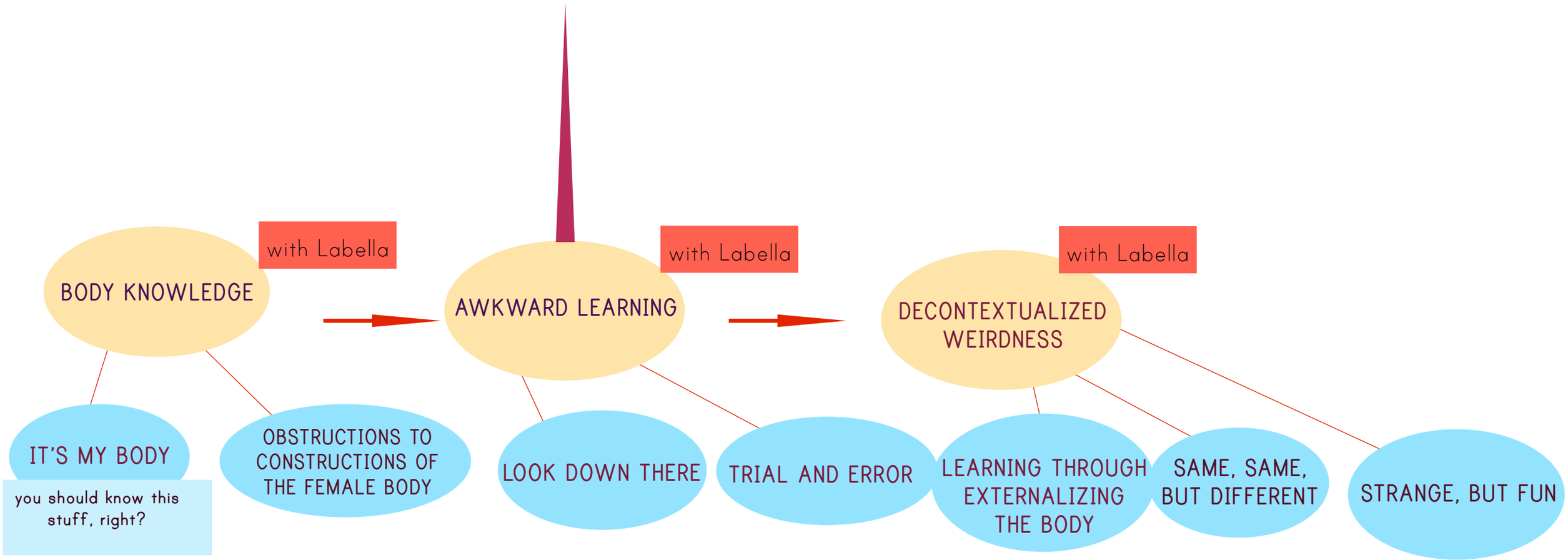
STRANGE, BUT FUN

EXTERNALIZING THE BODY

Tone of Learning

1. What I know is different from what I think I should know (Labella helped adding knowledge)
2. misinformation is based on barriers (communication, looking at oneself)
3. Labella help visualizing the body

1. Labella was a surprising interaction;
2. 'Looking Down There' (from traditional education) is awkward both psychologically and physically)
3. being asked to do this by the app seemed to somehow make it less taboo, and slightly amusing, leading on to the person feeling capable of doing this in the future (looking at their own bodies)



- Experiencing Labella together
  - Future probing pair suggestion Mother/ daughter
  - We chatted afterwards
    - tasks to do together
    - Discovered that partner exercises
      - Improves sex life
        - Reason he started doing PFME
          - Awareness of importance of pelvic floor as one is ageing
        - good way to pick it up
      - Interesting to have that same interaction experience for men
    - Finding a time suitable for both was difficult
  - Yes, shared experience
    - “It’s not strange to me”
      - PFME as treatment for premature ejaculation
        - incontinence prevention, health issues
      - Mutual caring about the relationship
    - Learning together as couple
      - Sharing resources
        - Mediums of reception: how does one learn about this?
          - “At least it’s certificated” ex: school vs internet
      - Information regulated by social norms & customary rules (women to women, etc)
  - No
    - “I’m not sure he was just a bit scared”
      - Probing knowledge & leading to embarrassment
- something that requires both to participate in
  - In this case it was an option

Interview Schedule

Conversation starter

. Did you learn something new by participating in this study?

. Do you find this approach adequate *(humorous, fun, easy, accessible)* to learn with?

BACK TO
-RELATES TO PRE-QUESTIONNAIRE-
Pelvic Fitness

. Were you familiar with pelvic floor muscle exercises/fitness before?
. If yes, how (and when) did you hear about it?

Is it *(pelvic exercise)* part of your intimate care routine? *If so, examples when you do it (ex: at home, or fitness class, etc)*

What was the first emotion/sensation/feeling when you first realized what was happening (study, first mobile/wearable interaction)?

Was it intuitive?

You were holding your mobile device quite near one of the most intimate parts of your body. How did that make you feel? Why?

Do you think that mobile technology can potentially support the delivery of information – or better, promote engagement with intimate care? What are your thoughts? Suggestions

Does learning by embodiment ('wearing' the technology) give a better perspective/understanding of where in and on the body this intimate care takes place?

What is your personal relationship with digital technology, such as mobile phones? On-body technology?
Do you use any (technology) for learning? Or for the matter, any of the 'quantify self' family to keep up (in whatever health activity). Thoughts.

What are your thoughts on using (digital) technology for creating engaging/embodied/ meaningful/fun/humorous experiences and learn about the body – towards preventive care. Wishes and desires.

How can the use of (such) technology make accessible this reality of intimate care that is laden with stigma and taboo?

Do you think humour/technology can contribute to promote self-awareness and preventative, intimate care practices. – How? Suggestions

Did this study contribute to enhance your body knowledge in any way, and did you find the technology engaging/or not? Why and how.

RESEARCH QUESTIONS

1.

PAMPERING ROUTINE TAG

BACKGROUND Our ethnography shows that women have little awareness of their bodies (quote from physiotherapist) and our previous exploratory study/design workshop (design kit) supports that too (it indicates that most women participants aged 15-52 had no or little knowledge of pelvic floor or pelvic floor fitness).

Daily rituals of intimate care, such as pelvic care/fitness, remain - for the most – a mystery: either based on *misinformation* (not knowing how to or what part of the body that attends to), *misconceptions* (ex: only women who've delivered should do it/take care of it) or *stigma/taboo* nature of the topic (involves sex-related parts of the body).

Non-expert participants:

KNOWLEDGE OF THE BODY Did you learn something new? Do you find this approach adequate (humorous, fun, easy, accessible) to learn with? Suggestions

KNOWLEDGE OF PELVIC FITNESS Are you familiar with pelvic floor muscle exercise/fitness?
If yes, how (and when) did you hear about it? (situation)

ROUTINE Is it (pelvic exercise) part of your intimate care routine? If so, examples when you do it (ex: at home, or fitness class, etc)

Background of study and relation to prior knowledge of each participant: understanding differences and similarities between experts and non-experts in terms of knowledge of the body and practice of pelvic fitness (how it is incorporated into their daily lives/routine).

2.

SOMETIMES I LAUGH SO HARD … TAG:

OVERALL EXPERIENCE This study asks you to look at yourself in what might be an unusual way. And looking at a part of your body that you may or may not have looked at before. However, what you see here is an augmented image of what you really have down there (not the actual part), as it is mediated by a piece of underwear and a mobile phone. What was the first emotion/sensation/feeling when you first realized what was happening? (*might relate to it's ok to peek campaign; 70s looking with a mirror*)

Was it – easy to understand and relate to from then on (intuitive)
Was it – easy and/or interesting/compelling enough to proceed throughout

EXPERIENCE WITH MOBILE PHONE You were holding your mobile phone quite near/close to one of the most intimate parts of your body. How did that make you feel? Why?

MOBILE PHONE (relate to previous question, whatever answers) Do you think that mobile technology can potentially support the delivery of information – or better, promote engagement with intimate care? What are your thoughts? Suggestions

WEARABLE Traditionally, we learn about this part of our bodies by browsing books, the web, in school. If in a doctor's consultation that learning will happen via anatomical models (cross-section, pelvis/pelvic muscle structure). Those models do the job, but may still be abstract and not easy to grasp. Does learning by embodiment ('wearing' the technology) give a better perspective/understanding of where in and on the body this intimate care takes place?

Overall experience and thoughts on this study; thoughts on mobile technology: use of mobile device, AR as technology to deliver humoristic viewpoint; (under)wearable embodiment and learning to make friendly/approachable and fun/make delight.

3.

MAKING ACCESSIBLE TAG

This study intends to make familiar an intimate part of the body that is considered a sensitive, troublesome topic (explain). On the other hand, it is also a part of the body that is extremely important to our health and wellbeing, as its health/good condition/maintenance is essential for core stability, continence, and key/vital for sex health/pleasure.

So it is important to talk and know about it, and to take good care of it. Our study gives you a first hand on experiment in which we're combining wearable and mobile technologies/exploring digital technologies to make it easy/accessible for every women to learn about it: away from medical terms but still using a mix of colloquium and biological terms, and step-by-step empowering you, as a user of that technology, to take action and care for your body: the technology is there to help you (it gives you an overview and 'shows' you how and what to do, even tries to look at you (can't really 'control' you because of the nature of that exercise (invisible) and also because it's not tracking your exercise in any way other than a subtle, brief timing (working 'together' while having a 'conversation').

So our technology intends to promote body knowledge, and speculates whether you've 'learned' with it, afterwards guessing that you did and are empowered to do it on your own from then on (your choice, of course). It does this rather than quantifying what you know, what and how you are doing it.

CONFORTABLE WITH USING TECHNOLOGY What is your personal relationship with digital technology, such as mobile phones? On-body technology?
Do you use any for learning?
Or for the matter, any of the 'quantify self' family to keep up (in whatever health activity).
Thoughts.

TECHNOLOGY TO MAKE PLAYFUL/HUMOROUS What are your thoughts on using (digital) technology for creating engaging/embodied/ meaningful/fun/humorous experiences and learn about the body – towards preventive care. Wishes and desires.

HUMOROUS TECHNOLOGY TO MAKE (TABOO) ACCESSIBLE How can the use of (such) technology make accessible this reality of intimate care/intimate parts of the body that is laden with stigma and taboo?

HUMOROUS TECHNOLOGY FOR INTIMATE CARE Do you think humour/technology can contribute to promote self-awareness and preventative, intimate care practices. – How? Suggestions

Did this study contribute to enhance your body knowledge in any way, and did you find the technology engaging/or not? Why and how.

Back to experience with mobile phone and body-worn approach to further understand relationships of and with technology; assess these in relation to humour in technology and relational knowledge/experiences; Identify possible next steps/point out to possible developments and designs for the follow-up study.

Open Lab
at Newcastle University

Exploring Intimate Wearables for Self-Care and Care of Others

Project information sheet

Teresa Almeida is a PhD Student at Open Lab, Newcastle University, working on human-computer interaction (HCI) with a focus on designing technologies for health and wellbeing. This study is part of her PhD project.

Study Designed for Couples

We have developed a materials kit that aims to support self-knowledge and knowledge of the other: by doing this, we aim to contribute to promote learning between couples regarding the female anatomy and explore female pelvic fitness* in relation to biological (i.e. reproductive system), medical and personal health (i.e. incontinence), positive health and wellbeing (i.e. sexual pleasure). We are asking you if you would like to work with us to help us to evaluate this new tool of wearable and digital technology that will support new perspectives and new ways of thinking about our intimate bodies in a way that will be fun and playful to learn with.

* Although this study design addresses female pelvic fitness only, awareness of pelvic fitness and pelvic health is equally important in both sexes. Nonetheless, our aim with this work is to explore the impact of knowledge (of the self and the other) in practices of intimate care that entail esteem and reliance on the self and each other.

What will I have to do?
We will deliver a materials kit to you. This materials kit will contain the following items: a wearable item (a pair of bespoke female underwear), a recordable voice pad, and a series of clothes tags that will include simple instructions and provide a space for you to write some thoughts. You will also be asked to download a piece of software (application) to your mobile device (iPhone).

This materials kit will be delivered to you by hand or by post. You will then keep it for the duration of a week. During this time, it is up to you when to proceed with the study and according to the instructions included. After that, we invite you to take part in a semi-structured interview. The interview can be held at your workplace, at a place of mutual convenience and suitability, via phone, or via Skype.

We will not ask you difficult questions or ask you to discuss personal issues. We are creating a design kit that we would like to make available to all women, and we will have conversations with you and your partner around how and what you think about it in order to help us develop it further.

What are the benefits of taking part?
You will be directly involved in the first trial of our design of a wearable and digital technology, which we wish to implement for all women. You will be able to test the technology, tell us exactly what you think of it and how well it works. You will help us with making the design better so that in the future women, and women and their partners, will also learn about female anatomy and physiology through playing with this technology. We think that the experience of taking part in the study will be enjoyable and interesting.

What information will you collect about me?
We would like to make some photographs and sound recordings of the part of the study you will be doing on your own time. Sound will be recorded when you first use the wearable item with the mobile phone, and later on in the same study you will be asked to take a photograph. It is up to you to share this with the researcher, and you will be given the option to do so or not. We do this so that we can go back over your response to the humour in the design and technology, which will help us make this work more meaningful and engaging later on.

What will happen to information you collect about me?
Only the people directly involved in the study will see the information we collect. We will use a code instead of your name on all of the information we take for the study. This will help keep your information safe. We will store the recordings we make for the study and the information we collect at Newcastle University. The recordings and information we collect will not be used for any other reason apart from the study.

Do I have to take part?
No. You do not have to take part in this study. If you currently have any health conditions which might be made worse by participating in this research then you may not wish to participate in the study. Even if you agree to join in at the start, you can change your mind throughout the duration of the study. Should it happen, you do not need to give a reason for it. Should you want to withdraw afterwards (by September 2015), you can also do so by informing the researcher. The researcher contact details are provided with this information sheet. This will not affect you in any way now or in the future.

Thank you very much for reading this information.

If you have any questions please feel free to contact:

Teresa Almeida
Open Lab, Newcastle University
Email: t.a.almeida@newcastle.ac.uk
Mobile: 07453236834

Dr Madeline Balaam (PhD Supervisor)
Open Lab, Newcastle University
Email: madeline.balaam@newcastle.ac.uk
Phone: 0191 246 4602

This research project has been approved by the Faculty of Science, Agriculture and Engineering Research Ethics Committee, Newcastle University.

Open Lab
at Newcastle University

Consent Form for PARTICIPANTS

I agree to participate in the study: **"Exploring Intimate Wearables for Self-Care and Care of Others"** being carried out by Teresa Almeida, PhD Student at Open Lab, Newcastle University.

- I have read and understood the information sheet about taking part. ☐
- The researcher has answered any questions that I had/ I have no further questions. ☐
- I understand that I will be audio recorded and photographed at specific times during the study. I will choose whether or not to share the audio file and/or the photograph with the researcher. ☐
- I understand that information about how I engage with the wearable and digital technology will only be made accessible to the research team. ☐
- I understand that the data collected for this study will be stored in a secure location in Open Lab at Newcastle University. ☐
- I understand that the data collected for this study will be used only for research purposes. ☐
- I understand that my name will not be used on any documents or in any presentations about the research. ☐
- I understand that I can leave the study at any time without needing to say why. ☐

Signature of participant I .....

Name (in capitals) …… Date……...

Signature of participant II …….....

Name (in capitals) …… Date……...

Signature of researcher……

Name (in capitals) ……..Date……..

Please feel free to contact the researcher with any questions:

Teresa Almeida
Open Lab, Newcastle University
Email: t.a.almeida@newcastle.ac.uk
Mobile: 07453236834

This research project has been approved by the Faculty of Science, Agriculture and Engineering Research Ethics Committee, Newcastle University