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Embodying the Emotional Pregnancy

Design Explorations of a Prenatal Yoga Multi-Sensorial Environment

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ABSTRACT

This paper introduces the design explorations of a multi-sensorial environment focused on emotional pregnancy. We define emotional pregnancy as the psychological and mental reactions to the transitional experiences towards motherhood/becoming a parent. We draw from insights into pregnant women's experiences and expert knowledge shared by midwives and doula to develop a sensorial experience and toolkit that combine affirmations, light, sound, movements and journaling. This is deployed within the context of a prenatal yoga setting with three women at different stages in their pregnancy. We offer insights into how a multi-sensorial approach to designing for the wholeness of pregnancy can support and empower women in their experiences of pregnancy, expand on societal understandings and foster the value of emotions during this time.

CCS CONCEPTS

• Human-centered computing • Interaction Design

KEYWORDS

Pregnancy, Women's Health, Prenatal Yoga, Affirmations, Motherhood, Multi-sensorial Environment

1 Introduction

Pregnancy is an emotionally overwhelming transition into mother/parenthood [25][30]. The physical and psychological challenges include e.g. weight gain, oedema, musculoskeletal discomforts, aches, and mood instabilities, all of which affect the pregnant woman's¹ overall wellbeing [9]. Furthermore, pregnancy involves well-established societal demands, not least that of being a good parent [9][23]. These challenges and demands during the different stages of pregnancy can lead to maternal stress, which in turn has a line of negative consequences for the development of the fetus [9][26], or can leave the pregnant woman especially vulnerable to emotional stress [29]. In recent years, a proliferation of digital technologies has provided the tools to navigate the different stages of pregnancy and support some of these concerns [23]. More specifically, the HCI community has explored the state of *being pregnant* through the lens of maternal health across different technology-enabled contexts. These include e.g. attending to socio-cultural norms [37], geographical contexts [1], or designing for shared and supportive experiences across genders [6]. In particular, self-tracking technologies remain popular and widely available on the market, focusing on a variety of solution-driven approaches to nutrition or exercise, through to community sharing or more accessible communication with healthcare professionals [39]. Self-tracking and monitoring have become part of many pregnant women's lives, in turn making them more conscious of their responsibility toward their

¹ In this paper, we are solely focusing on pregnant ciswomen (please refer to Section 5.)

unborn child [22]. But, while the physical body, which can be intensely tracked through technologies, gains a renewed focus of attention [26], what happens to the *emotional body*? In this paper, we highlight the **emotional pregnancy**, thus engaging with the psychological impact of pregnancy in a woman’s wellbeing, and explore how a holistic approach to pregnancy could provide further support to women and their changing body, and aid in navigating mindfully through these changes. Although there are many ways to define emotions and because of their complexity in nature, in this study we work with emotions or the emotional state as ongoing states of mind deriving from outer stimuli [35]. We present insights from conversations with five pregnant women, two midwives and one doula². We introduce a prenatal yoga class with three pregnant women in which we explore our preliminary design of a multi-sensorial environment to extend the embodied experience of pregnancy. This includes exploring a set of *affirmations*, which we use to enquire about the women’s wellbeing in relation to their emotional experiences in pregnancy. Affirmations, in this paper, derive from self-affirmation theory [36], which introduces an affirmative/positive responsive method against external stress towards one’s self-understanding (ibid). We contribute towards renewed approaches to designing for and with pregnancy in HCI.

2 Related Work

Traditionally, the design of digital interventions for pregnancy and the pregnant body has focused mostly on issues of maternal health and care. Here we consider such approaches to better understand how HCI has attended to prenatal care, the significance of emotions during this time, and consider the practice of yoga as a tool to support those who are pregnant.

2.1 HCI and Pregnancy Care

Pregnancy in HCI includes the design of mHealth applications used as preventive tools and devices, such as those discussed in e.g. [2][31][37], and that of (self-)tracking and monitoring technologies, such as [6][14][43][44]. These range in topics including maternal mental health, excessive weight gain in the lower-income bracket, or cultural diversity, and examples of technology encompass a pregnancy wearable for men, a system which facilitates communication between the parents, or a system that works as a bridge between the obstetrician and the pregnant woman. For the most part, these digital applications include healthcare professionals in the experience and aim to provide an opportunity for better support of the pregnant woman or partners to experience the bodily changes in pregnancy. Certainly, as technology-enabled applications become part of our everyday lives, becoming subjects of digitisation is inevitable [20]. As suggested by Thomas and Lupton in [39], a large number of these applications can be viewed as either ‘*threats*’ or ‘*thrills*’. ‘Threats’ are applications focusing on the risk factors of pregnancy and ‘thrills’ are those focused on ‘enjoyment’ instead. This classification is used to show how the two categories of applications socially construct the discourse of being pregnant. Moreover, both argue that the pregnant body is presented in problematic ways and enabling risk discourses (ibid). For example, on the one hand, digital technologies advocate for a healthy pregnancy and fetus by documenting e.g. nutritional behaviours, daily changes, fetus movements, prenatal exercises, and/or community sharing [14][43][44]. On the other hand, these same technologies can be challenging, as in many cases they present gaps between the data and the pregnant woman’s experience [31]. In other words, while some features have shown to be supportive toward pregnant women’s feeling of confidence during pregnancy [19], the use of technologies for tracking, monitoring and self-surveillance can also be argued to be a way of distancing oneself from the physical and mental body [39].

While self-tracking systems and tools continue to proliferate, our previous research has shown that attention towards *emotional pregnancy* is still lacking [38]. We understand this detachment can be detrimental to

² A doula is a non-healthcare professional supporting the pregnant woman and potential partner during her emotional and physical experiences before, during and after childbirth.

women's health and subjective wellbeing and instead aspire to reimagine interactions that fully account for the situated and material body. Demands women undergo during pregnancy and in giving birth, such as "physical, emotional, mental, and pain" [9], stress the need to design interventions that better support managing this life-changing event. The systems aforementioned might be beneficial, however, in our design work, we explore the emotional qualities and embodied experiences in pregnancy while remaining critical towards tracking technologies.

2.2 Emotional Cha(lle)nges in Pregnancy

Pregnancy encompasses a significant emotional transformation, and one worthy to investigate since some studies show how the mother's state of mind affects the growth of the fetus and early childhood [28][41]. Thus, supporting and empowering women through their pregnancy and creating a safe environment to be aligned with the bodily changes not only provides for better experiences in pregnancy and birth but also gives the child the best possible start in life. Other studies have shown that the emotionally overwhelming transition into motherhood [25][30] stems from humankind's need to protect and nurture the infant and that it might be of "*evolutionary advantage for women to be particularly sensitive towards emotional stimuli and hypervigilant towards emotional signals of threat by late pregnancy*" [29]. The emotional changes influence the woman's behavioural patterns [40] and the physical challenges can lead to other worries such as the health of the fetus [15][40]. Anxiety can cause a feeling of loss of control and lack of support during both pregnancy and birth [8].

Emotions are complex to define and difficult to explore in HCI, as they are subjective and perceived in the specific setting and/or interaction [7]. However, the number of digital applications that aim to improve people's wellbeing keep increasing [45]. One example that deals specifically with emotion has taken place in a hospital setting and has put particular focus on how technology can connect their patients with appropriate services, therefore offering enhanced experiences [17]. In [38], we have started exploring emotional pregnancy as diverse and individual. While critiquing current cultures and Western norms surrounding pregnancy, we explored the emotional facet of pregnancy to support and empower pregnant women through designing systems which focus on the individual voice of pregnancy and in changing how pregnancy is often perceived by the public to advocate for systemic change. This paper expands on this previous work by elaborating further the significance of the emotional pregnancy and novel ways to attend to it as explored through the lens of prenatal yoga and the senses.

2.3 Yoga as a Sensory Feedback

Yoga is an ancient system of Indian thought and can be explained to be attentive in action [11]. It includes a variety of bodily movements, breath work, relaxation techniques and meditative practices [16] and enables higher levels of energy, body awareness, clarity and general wellbeing [12][16]. There is a great number of branches of yoga, however, in this study, we focus solely on the practice suited for and supporting of the pregnant body. More specifically, prenatal yoga programs have shown to be beneficial in pregnancy and birth outcomes [9]. Several improvements have been proven as an effect of prenatal yoga on psychological and physical levels both during pregnancy and birth [34], and an online prenatal mindfulness course with a focus on the emotional qualities of pregnancy showed to provide health benefits such as reduced levels of stress, anxiety and depression [18]. Techniques on relaxation and self-soothing are especially important in this transitional time for the pregnant woman's wellbeing as well as the health of the fetus [3][9].

Moreover, yoga has recently been explored within HCI and interaction design [4][24][42]. Mainly, these are design interventions that have focused solely on the physical nature of yoga as its focal point, and therefore put less focus on the emotional; mindful qualities of the practice. Other yoga-driven research within the field specifically seeks to support blind people such as in [32][33], whereas another study explores an agent-based model focusing on the yogic breath as a tool to decrease stress [27]. Previous research has explored a multi-sensory experience through enabling sound, scent and colour, focusing on a specific branch of yoga to create

a relaxing environment, thus focusing on the therapeutic aspect of a yoga practice [13]. The latter relates to our study, however focusing mostly on the visible physical movements to create sensory feedback, whereas our multi-sensorial environment aims for yoga to be part of a toolkit towards enhancing emotional wellbeing. While these are impactful and beneficial studies, we understand that yoga is the sole focus of attention. This has shown to be useful for us to understand the benefits of yoga and its growing relatedness to the HCI community. Taking on a deeper level, working with the emotional aspect of pregnancy and applying yoga postures to increase the connection to the changing emotions during pregnancy, we take a different perspective and combine it with self-affirmations, sound, light, and yoga postures intended for relaxation.

3 The Study

We introduce a set of research consisting of an exploratory workshop with pregnant women and a series of interviews with midwives and a doula; subsequently, we organized a prenatal yoga session comprising of a bespoke toolkit and three participants. In the following, we introduce the preliminary research study data and the prenatal yoga multi-sensorial environment.

3.1 Exploratory Workshop

We started this research by conducting an exploratory workshop with five pregnant women, age range 25 to 31; Petra, Martha, Jasmine, Julia and Maggie (pseudonyms) were recruited via a social media event, posters in yoga studios and snowball sampling. The women were at various stages in their pregnancy, and all were first time pregnant and in heteronormative relationships. The workshop took place at HÉLT yoga studio in Copenhagen, Denmark. It was divided into two parts: i) the first part consisted of individual presentations and discussions based on a short questionnaire. This included questions about their concerns and personal strengths and an artefact we asked them to bring from home which they considered as being helpful to them in their pregnancy, and ii) a design activity where the participants were asked to sketch some of the challenges they faced during pregnancy and any challenges they anticipated when giving birth. They were offered various drawing pencils, moulding clay, paper in different sizes, and post-it notes. The workshop ended with the participants presenting their ideas.

3.2 Interviews

We carried out expert interviews with two midwives, Johanne and Freya, and one doula, Ellen (pseudonyms). These were semi-structured interviews and lasted 60 minutes each. Johanne had recently begun working in her private clinic fulltime after five years in public hospitals. Freya worked in a local public hospital and Ellen worked privately. They were asked questions about the pregnant women they encounter in their professional setting, most frequently asked questions and worries, and how they perceive pregnancy in the current societal structures. With participants' consent, the data of the workshop and interviews were audio-recorded. Data were then transcribed and coded (in an iterative coding process) by one researcher. The analysis was carried out using an inductive thematic analysis approach [5].

3.3 A Prenatal Yoga Multi-Sensorial Environment

Participants

Three participants between the ages of 29 and 34 were recruited via a social media event, posters in yoga studios and snowball sampling. They were at various stages in their pregnancy, were all first time pregnant, and in heteronormative relationships. Susan, an experienced yogi, aged 29 was in week 39, feeling secure and in general enjoying her pregnancy; Line aged 34 was in week 30 and had just started to attend prenatal yoga classes; and Pil aged 29, in week 34, emphasized that yoga was not something she was engaged in. The names are pseudonyms to protect their anonymity.

Data Collection

The multi-sensorial environment was structured as a two-hours yoga session. It was divided into three parts according to the three themes resulting from the preliminary research and guided by three affirmations. The session took place at HÉLT yoga studio situated in Copenhagen, Denmark. The full session was audio-recorded and participants wrote in journals provided to them.

Setting: Studio Space and Toolkit

The Yoga studio provided yoga props such as bolsters, mats, blankets, and eye pillows. The room was prepared in advance of participants' arrival, arranged in a circle with space for each of them with the yoga props and a focus on a *safe space*. In the centre of the circle, we had placed an in-situ prototype in the form of a lamp with an adjustable light bulb and a built-in recording device and speaker (figure 1). Moreover, the toolkit consisted of the design of affirmations and related yoga postures, and the individual journals and writing materials available for each participant to use during the session. The affirmations were recited in the group and recorded to later be listened to collectively. These worked in tandem to explore the women's thoughts and experiences throughout the session and concerning their pregnancy. We had a remote for the lamp, making it possible to control the light settings during the session accordingly with the themes/affirmations.

Figure 1: Setting of the environment with yoga props, journals and prototype/lamp.

4 Findings

4.1 Pregnant Women, Midwives & Doula

Exploratory Workshop

This preliminary study included a two-hour explorative workshop with a group of five pregnant women. It aimed to inquire into the pregnant woman's life, how she was feeling and what her behavioural patterns were. The workshop was exploratory in nature and was divided into two parts: initially it focused on conversations

among the whole group and secondly, a hands-on design activity for which we provided the tools for them to actively engage and think through ideas and concepts on how to improve their experiences of pregnancy. In the first part of the workshop, the participants were asked questions such as “*What are your major concerns in your pregnancy?*” and “*What is your biggest source of support?*” to gain insights into their everyday life and reasoning and thus understand what could be improved and what works well. First, they were asked to write the answers down on paper to subsequently share them in the group. They described their use of mobile applications, their interactions with partners, healthcare professionals, friends and family, their fears and strengths and how they obtained information. Maggie, who was in week 37, shares how early on in her pregnancy it had been challenging because she felt lonely. She comments: “*It was hard because I didn't know that other people felt that way too.*” (Maggie)

Various insecurities related to the changing body were also a topic of conversation. Petra, who was in week 26, remarks: “*My biggest worries are physical implications. that I can't do what I usually am able to. I'm scared of symphysis pubis dysfunction³ and scared of not being able to be sociable and to ride my bike. I'd like to continue to be me!*” (Petra)

Martha, week 30, was worried about navigating in the various types of pain. She comments: “*what kinds of pains are normal and which ones are not, in which stages of the pregnancy? Twice I have called the maternity ward because of pains from early contractions I didn't understand.*” (Martha)

In the hands-on activity participants used drawing pencils in various colours, post-it notes and glue. This opened up for conversations around their respective situations and biggest concerns. They suggested activities such as community building for pregnant women to come together and an app for resting and promoting serenity that could help the pregnant woman in slowing down during pregnancy. Moreover, they discussed pain and conceptualised a vest with heat features for pain relief and a teddy to stimulate the senses with smells and light for the room to remain calm during labour. These inventions or ideas emphasise the comments they had made earlier and whilst working on the designs new reflections came forward. These interventions were responses to some of their main concerns during pregnancy and for giving birth.

On the one hand, the challenges of the changing body, both in its physicality and sense of pain are consequential concerns. On the other hand, emotional concerns such as not being able to do the same things as before pregnancy, the experience of loneliness, and being alone with the worrying may happen simultaneously as the body is changing. Overall, the participants acknowledged that community building and sharing information with other pregnant women was helpful for them to feel empowered in their pregnancy and understood that taking responsibility in pregnancy would lead to improved pregnancy and birthing experiences.

Expert Interviews

We conducted three 60 minutes semi-structured interviews with three experts in pregnancy, two midwives and one doula. Their professional expertise includes supporting and helping women in their pregnancies both in private practices and in hospital settings. At the time of the interview, they were all offering prenatal birth preparations including acupuncture, rebozo⁴ and prenatal yoga. The interviews aimed to discuss the emotional pregnancy more broadly, with a focus on themes of the pregnant body, societal issues and giving birth itself. The interviewees recognised two divided worlds: the medical and emotional perspectives on pregnancy. The medical explained as the structured, practical, even distanced perspective on pregnancy and the emotional being the mental strengthening and supporting perspective. Johanne (midwife) explained that

³ Symphysis pubis dysfunction is pain or discomfort in the pelvic joints often experienced during pregnancy.

⁴ Rebozo is a gentle form of massage originating from central America used to ease pain during pregnancy and labour.

because of the limited access to midwives, pregnant women search on Google for information, emphasizing that there should be more focus on getting to know the changing body: *“We have to find the resources to empower them to feel their bodies. Get to know it and understand that they have a body that speaks to them but maybe they haven’t been used to listen to it.”* (Johanne, midwife)

Ellen (doula) and Freya (midwife) also emphasized that women often forget that it is their bodies and that sometimes it is not the professionals that know what is best. This was discussed concerning both pregnancy and giving birth, and that some trauma related to birth often occurred when healthcare professionals, such as the doctor or midwife, made decisions or took responsibility instead of the woman herself. Freya explains further: *“It’s like they need someone else to feel for you. We ask them to feel for themselves but maybe we have become bad at trusting our intuition.”* (Freya, midwife)

Ellen mentions how she finds hospitals to be fear-driven and elaborates on this by speaking to the doctors and midwives who are trained in medicine and safety, rather than looking into the emotional aspect of the pregnancy. Here, it is also where supporting the woman’s mental state itself is important, by helping or empowering her to feel her body for herself. She comments: *“I wish there was more focus on that instead of all of the tests and scans, and to fit into a doctor’s journal, and that you can’t be too fat, because if you get too fat you can’t give birth at home. And here’s your pregnancy in a chart. Things like these become very practical but the emotional things are just as important.”* (Ellen, doula)

The expert interviews suggest that emotional aspects of the institutional support are limited, which leave pregnant women with questions, for instance, *“Is this normal?”*; *“Am I being a good pregnant woman?”*; or *“Is the pain good or bad?”*. These questions are indicative of some of the insecurities felt and challenges to be dealt with by them, the pregnant women, and resonate with findings from the exploratory workshop. We continue to explore such concerns through the themes of *Bodily changes*, *Responsibility*, and *Loneliness*.

Bodily Changes, Responsibility, and Loneliness

Bodily Changes refers to the challenge of accepting the changes in the body during pregnancy. *Responsibility* refers to the lack of responsibility the pregnant women were taking in their pregnancy, such as inadequately preparing for labour and motherhood mindfully. *Loneliness* refers to the loneliness the pregnant women experienced during pregnancy and the challenges they experienced when asking for help. The three themes build the foundation for designing a multi-sensorial environment, which we describe and expand on in the section that follows.

4.2 Prenatal Yoga Multi-Sensorial Environment

This session introduced a grounding exercise which continued into a yoga practice of selected complementing postures with varying environmental lighting. These postures and variations in light intensity were related to each theme and designated affirmation of #1 *Bodily Changes: I allow the changes in my body to open up for bodily explorations to connect with my baby*, led with semi-dimmed light; continued with #2 *Responsibility: I take responsibility for my pregnancy by seeking information when needed and following my intuition*, introducing a brighter light emphasizing more strength; and finally the affirmation on #3 *Loneliness: I deserve and I take the support that I need from the people around me*, in which we created a more cave-like setting to prompt the feeling of a safe environment. The series of affirmations, which are based on the shared ‘insecurities’ and observations derived from the exploratory workshop and expert interviews, were developed by the first author, who is a prenatal yoga teacher.

Each affirmation was recited six to nine times as a group while audio recording. Afterwards, each participant was asked to partake in a free writing exercise, using their journals. Similarly, they listened to the recordings of the recited affirmations in the group and were asked to write in their journals about their experiences.

Participants were also asked whether they could imagine listening to the reciting of the affirmations at home. This was hypothetical so to understand whether the environment could expand to a setting at home.

#1 Bodily Changes: I allow the changes in my body to open up for bodily explorations to connect with my baby

The participants were joined by the first author in reciting this first affirmation, which was repeated a couple of times. It was vulnerable to recite this first affirmation as the participants were only warming up and getting used to their voices. They were sceptical about both the concept and about listening to the recording at home. Reflecting on the question *How did the recording make you feel?* Susan felt somewhat uncomfortable. She remarks: *"It made me laugh, maybe a bit uncomfortable at first... getting used to the message would surely take this away as you get 'one voice' together."* (Susan)

It became apparent that reciting the affirmations felt more useful than listening in this first round. *What was the difference between reciting and listening to it?* Line comments: *"I felt it less strongly when listening to it compared to when reciting"*. She elaborates that *"it would be the second-best option if not being able to take part in an actual session in e.g. a yoga studio."* (Line)

When asked if she could imagine taking the device home to listen to the affirmations, she considers:

"I could imagine doing it in an extension of a class. But to me it would be important to listen to it relatively soon after the recording of the affirmations so they are not too distant in memory." (Line)

Pil was probably the one who found this the most challenging. She comments: *"especially in a collective when you're not very yoga conditioned. That being said, I do think that there is a strength to listen to it at home – to be reminded to let go of negative thoughts. The question is whether you would actually sit down and turn the recording on or whether it should be 'pushed' more."* (Pil)

This affirmation resonated the most with one of the main 'concerns' found in the preliminary research, that of **the changing body**. In this first part of the session, we found that the comments were mainly on the concept rather than on the affirmation itself.

#2 Responsibility: I take responsibility for my pregnancy by seeking information when needed and following my intuition

Participants repeated the affirmation six times in a row, which made the reciting more synchronous. This time Pil had written down how she began to notice certain things in the affirmations differently. She noticed 'my pregnancy' and commented that it helped her to be more focused on the fact that it was *her* pregnancy: *"it helped to remind me that my pregnancy can't be compared to anyone else's."* (Pil). Furthermore, the journal reflections were more positive towards the concept and about bringing the recording home to listen to: *"This made me want to take this home. There was something useful in repeating it. More than the last one."* (Pil)

Susan thought that the connection between reciting and listening to the affirmations made them stronger and would be less strong if taking them apart. Reflecting on whether she thought she could picture herself listening to this at home she was positive: *"Yes. I really can. If you practice them together, repeat the same message during class and then have the option to listen to them in your own time."* (Susan)

Line, on the other hand, thought that the reciting part was the most powerful and if she was to take it home, she would recite the affirmation together with the recording. She comments: *"There is a positive power of saying the words out loud instead of just listening. So, I would probably recite it along with the recording when listening to it."* (Line)

At this point in the session, the participants seemed to have become more comfortable in the group and noticed the words they recited. During this affirmation, the light was bright as it intended to support them in

'keeping alert' while reciting the affirmation. The voices as they recited were louder than in other affirmations.

#3 Loneliness: I deserve, and I take the support that I need from the people around me

When we began working with this affirmation the light had been dimmed to create an atmosphere that invited the participants to stimulate the parasympathetic nervous system. As the light was dimmed the participants made themselves comfortable and wrapped themselves in blankets. Line, who had mentioned during the previous affirmations that she preferred reciting them, changed her opinion during this affirmation. After reciting she expressed that listening to this affirmation was stronger for her than reciting. She remarks: *"I felt this affirmation spoke to me the least... it could possibly be because I feel I am very open to help and guidance from those close to me (...) the voices from the recording wrapped me like a warm blanket."* (Line)

Susan expressed that this affirmation resonated with her the most: *"I felt this one the most. We sounded so peaceful and coherent together."* (Susan)

To Pil, bringing the recording of the affirmation home would work well with a recorded relaxation exercise to get in the mindset of a supported feeling. She commented on how deeply affected she felt: *"I actually felt sad that I don't allow people to help me more or that I don't reach out more."* (Pil)

After, listening to the recording Susan articulated that it provided her with deeper reflection to listen to it after reciting it first. When reflecting on the environment, and in taking part in something as a group, she considered how the strength of a community can be powerful. Also, the way we can use affirmations by reciting them together and how this might create a community without the challenge of reaching out and without having the obligation to nurture relations: *"As a community, with other women who are going through the same changes... this is so powerful to connect and teach ourselves."* (Susan)

In creating the sound together through the affirmations, listening to it afterwards, along with the settings of the lights changing during the session, invited for personal reflection. Each affirmation prompted a variety of thoughts and feelings in the participants. They would feel challenged reciting one affirmation which brought to life reflective thoughts on what they needed to improve in their lives. Another affirmation was of a confirming nature, that they felt whole and content. For instance, for Pil, it became clear that she had been good at accepting and listening to bodily changes. However, she was very affected by the *Loneliness* affirmation and to her, it became clear that she needed to reach out and ask for help. Susan found that the affirmations were general enough to resonate with most pregnant women and she was also moved by the variations of emotions occurring throughout the session. Line enjoyed reciting the first affirmation, listening to the second, and with the last one felt that she was already capable of seeking support. Pil expressed that she would never have thought about changing the light settings and that it made sense that the lamp was controlling the light of the room depending on the intent of the affirmation. Line said that she had not at all thought about it but when she became aware of the light she felt calmer when the lights were dimmed. Susan emphasized that the affirmations felt stronger with the movements, especially the last affirmation worked well with the supported posture as well as with the dimmed light. She felt so supported in the designated posture that she stayed in it for longer than it was guided.

5 Limitations of this Study

This study has been carried out with only first-time pregnancies, which may affect our findings. However, as every pregnancy is different and different emotions are triggered in different situations by various outer stimuli, we understand that the study could potentially be just as beneficial to any pregnancy. This needs to be further investigated through future studies that include women in all trimesters of pregnancy and pregnant women who have experienced pregnancy before.

5.1 Gendered Experiences of Pregnancy

In the study introduced in this paper, we are solely focusing on pregnant ciswomen and introduce data that includes a small sample. We acknowledge that our reflections converge towards this group of women. Research on the complexity of family settings is limited to non-existing. In the heteronormative pregnancy, a mother and a father to the child is involved. However, this perspective on heterosexuality as the norm excludes other parenting settings such as the single mother, the transgendered man or the lesbian couple. The complexity of family settings is underrepresented in society and the medical staff is undereducated in how to deal with lesbians, bisexuals and transgender men [10]. We believe there is a pressing need for change and suggest that future studies on designing for the emotional pregnancy should expand the focus, and to include research with participants of the LGBTIQ+ community. We suggest that the HCI community continues to work with the significance of the emotional pregnancy, as it relates to inclusion, mitigating stress factors and enhanced focus on the individual pregnancy.

6 Discussion & Future Work

In this section, we discuss the current state of pregnancy-tracking technologies and how, in the context of emotional pregnancy, technology is currently supporting the health and wellbeing of pregnant women. We then advance possible avenues of future research.

6.1 Beyond the Digitisation of Pregnancy

As suggested in our findings, each pregnancy is an individual transition and a variety of emotions can be presented. Surely, the individual experiences can be influenced by cultural, economic and social settings and backgrounds [26]. Through our study, we learned that our participants, who as a group have e.g. the economic means and the education to support themselves, feel *insecurity* when it comes to navigating their pregnancy, particularly when it is concerning the changing body. As aforementioned, digital technologies are popular in tracking the various stages of pregnancy and have become a tool to take control of one's bodily changes [21]. These current technologies are mostly mobile applications, e.g. similar to the ones previously mentioned [14][43][44]. Many of these technologies address prompting a healthy fetus and thus adding to the pressure of being the 'good' parent [23] and/or contain commercial intentions [39]. Here we distance ourselves from intentions as such and instead open up for renewed approaches to how we interact with technology and the body. Moreover, we shed light on the disembodiment that arguably follows some levels of self-tracking and call up the importance of changing the perspective, specifically one that incorporates emotions and the *emotional pregnancy* throughout this transition in life.

The challenges of mobile applications are more evident when the pregnant body is represented as a site of risk and pleasure other than focusing on emotional wellbeing or that these applications are reproducing ideals around heteronormativity [22]. Moreover, technologies 'dictating' how to be good at being pregnant or mothering often make the pregnant woman neglect her own physical and mental wellbeing [22]. As shown with the expert interviews, the midwives and the doula are concerned that women are not feeling supported enough to be in touch with the changing body and that they are not listening to it. Because of the lack of access to hospital staff, women rely on searching the internet as a primary source of information, as much as in 'trusting' self-tracking applications. Arguably, the use of self-tracking technologies creates a distance between the user and her bodily and mental wellbeing [22]. We understand the importance of self-tracking technologies and how they can bring power over or empowerment to one's pregnancy when access to professional support is limited. However, this paper stresses the importance of emotional wellbeing of the pregnant woman, not by distancing ourselves from self-tracking technologies but instead by unfolding a rather unconventional way of thinking about technology. We acknowledge the benefits of the related work within HCI as presented in this paper, however, we also strive to emphasize that each body is unique and that it is important to shed light on validating and giving value to the individual experiences of pregnancy which

affect the health of the fetus. By exploring yoga, through the combination of prenatal yoga movements, light, sound, and affirmations, we sought to understand how the participants responded to stimuli beyond the screen. The development of the feedback in the designed multi-sensorial environment is notable. At first, the participants seemed sceptical and insecure. This changed quickly as we continued to the second affirmation where they seemed more comfortable reciting in a group, getting to know their voices. For the final part of the session they had changed significantly from the first part and the feedback showed that the session had somehow affected them. While they stressed that they felt in touch with their body and emotions through practising or reciting the affirmations, overall the outcome seems to have led to personal and collective reflection and encouraged confidence and trust in themselves.

6.2 Future Work

This paper is centred around a small sample of women living in Copenhagen, Denmark, all of which have access to healthcare and economic opportunities to acquire further support through private antenatal courses. We acknowledge that factors such as socioeconomic circumstances or culture may vary deeply and the emphasis we have put on the practice of yoga can be understood differently too. Regardless, the health of the fetus is dependent on the health of the pregnant woman. Thus, we see prioritizing the emotional pregnancy as leading to better pregnancy and birth experiences. With the focus on *emotional pregnancy*, we stress the importance of digital technology interventions to account for a holistic approach to the pregnant body. The study is an inquiry into technology as it is currently, for example, the focus on mobile applications, and aims to expand on how pregnant women and their families relate to and make use of technologies. In this paper, we suggest a multi-sensorial environment, one in which the technology is integrated into the prototype which sets the scene of the environment. Further design studies can expand on the digitality of the prototype. Our multi-sensorial environment suggests how a supportive environment, such as that of a prenatal yoga class, can support and generate knowledge about pregnant women and support them in the process and experience of pregnancy. Future work includes expanding on the multi-sensorial environment by inviting a more diverse socio-cultural participant body and backgrounds into the study. This will allow for investigating directions for producing the affirmations with the participants of the session so that the affirmations might be more tailored towards the individual pregnancy. These could then lead to design opportunities such as to structure sessions and the development of the toolkit for use with and as an extended offer available for all pregnant women through collaboration with for example hospitals and healthcare professionals.

7 Conclusion

This paper introduces a multi-sensorial environment aimed at shedding light on the emotional significance of pregnancy. This included discussing how digital technologies are in use, and how they can be used to enhancing what a pregnancy embodies. We based our research on conversations with five pregnant women, two midwives and one doula which led to exploring the design of a multi-sensorial environment that aimed to extend the embodied experience of pregnancy. During the course of the explorations of the multi-sensorial environment, we learnt that building up a supportive environment and creating a space where the pregnant women felt safe takes time before they become comfortable in the setting. Moreover, in this paper, we show how a sensorial-based approach could add value to how the participants view and understand their pregnancy. Conclusively, we contribute towards renewed approaches to designing for and with pregnancy in HCI and future work within this field, one which can expand on and dismantle the current societal understandings of pregnancy.

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