Engaging with Health Data: The Interplay Between Self-Tracking Activities and Emotions in Fertility Struggles

MAYARA COSTA FIGUEIREDO, University of California, Irvine, USA

CLARA CALDEIRA, University of California, Irvine, USA

ELIZABETH EIKEY, University of California, Irvine, USA

MELISSA MAZMANIAN, University of California, Irvine, USA

YUNAN CHEN, University of California, Irvine, USA

Self-tracking data is often seen as a means to reflect and achieve a goal, usually focusing on positive insights and actions. Lately, some studies have discussed the negative consequences of self-tracking, suggesting that people interact with personal data in different ways. We explored how self-tracking activities and the emotional context characterize how people engage with personal health data through the analysis of a complex and emotionally-loaded use case: fertility self-tracking. We qualitatively analyzed patient-generated content in an online health community dedicated to fertility. We found five distinct types of engagement with data: positive, burdened, obsessive, trapped, and abandoning. Each of them is composed of an action and an emotional component that mutually influence each other. We discuss how the interplay of these components characterize a person's engagement with data, how the online forum made these issues visible, and how they are embedded in the self-tracking culture. We also provide insights into the implications of these issues for self-tracking tools. Finally, we hypothesize how people transition through the types of relationships with data, suggesting directions for future research in the area.

1 INTRODUCTION

Self-tracking, or personal informatics, consists of the practices of collecting personal data to reflect on, aiming to acquire self-knowledge or achieve a goal [34]. These practices can be conducted with or without the use of technology [34]. However, recent years have seen a rise in the popularity of self-tracking applications and wearable technologies designed to facilitate tracking behavior [24,46], leading to many different studies of technology-enabled self-tracking that come at the phenomenon from different perspectives [19]. Across the board, self-tracking research attends to the individual and mental experience of tracking through the construct of 'self-reflection'; the general model involves individuals being exposed to their tracked data, reflecting on that data, and taking action based on that data [33]. This process is often assumed

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to be positive and agential. Some of the described benefits are related to how self-tracking inspires reflection [6,33] and positive behavior change, helps in managing chronic diseases [42], and contributes to a sense of control and agency [3].

Often self-tracked data is seen as a means to achieve a goal (which can be reflection, behavior change, self-knowledge, disease management, diagnosis, or documentation. [51]). Recent studies have described the negative consequences of self-tracking, such as feelings of failure, guilt, and stress that can lead to abandonment [2,3,13,14,16,17,30]. While some research has pointed to the unintended consequences of self-tracking, few of them have focused primarily on its emotional impacts. Examples include Eikey and Reddy [16], who highlight the obsessive behavior that can arise from self-tracking in the context of eating disorders, and Ancker et al. [2], who discuss the moral load that glucose data may carry. Inspired by previous work on the emotional consequences of self-tracking, we conducted a study focusing on the interplay between self-tracking and emotions. We chose a specific health concern, highly personalized and complex, in which the person has low or almost no control: fertility. Our study explicitly focuses on the interplay between emotions and tracking, in an emotionally-loaded situation in which negative emotions could directly undermine the goal (i.e., negative emotions, such as stress, may reduce chances of getting pregnant [22]), making understanding the emotional impact critical.

Fertility struggles are not uncommon: 7.5 million women face fertility challenges, and 6.9 million have used infertility services in the U.S. [9]. Self-tracking is prevalent in fertility treatments, from the more straightforward (i.e., fertility awareness methods) to the more advanced ones (i.e., *in vitro* fertilization or IVF). These self-tracking activities can help women plan their conception efforts (e.g., intercourse) and give them their best chances of success. In this study, we qualitatively analyzed posts of a community focused on fertility challenges in an online health forum. The forum configured a channel where women in many stages of this fertility endeavor discussed their challenges and activities. These data allow us to explore the emotional experience of tracking in an empirical setting where the relationship between data and the desired outcome is complicated and imperfect. Further, online posts provide in-situ insight into the emotional state of people seeking social support. Our findings suggest that emotional state influences tracking, and tracking impacts the emotional state of those who track. As such, the context of fertility struggles provides an opportunity to explore a scenario in which users face an ambivalent and challenging relationship with their data, as tracking can only improve chances of fertility, not guarantee an outcome or goal achievement.

In sum, our study contributes to the understanding of the emotional components of self-tracking behavior, particularly when the link between self-reflection and the possibility for goal achievement is not transparent to the user. We describe five different types of engagement with health data from our analysis: positive, burdened, obsessive, trapped, and abandoning. We suggest that engagement with self-tracked data emerges from the interplay between tracking behaviors, the sense that one can approach the desired goal and emotional response to this relationship. Finally, we discuss how self-tracking is a social product embedded in a much larger socio-cultural structure that influences its practices. We specifically discuss the role of self-quantification culture in the emotional context we describe.

2 BACKGROUND

Self-tracking is the practice of collecting and reflecting on one's data to acquire self-knowledge or achieve a goal [33]. It is used in many different areas, such as fitness and physical activity [23,35], productivity [43], finances [31], and health. In the health domain, self-tracking usually focuses on preventative health [6] or the management of chronic conditions [41]. The most common objectives are to improve awareness of the state of general health or a specific condition, to achieve a goal (e.g., lose weight, quit smoking) [11,27,48], to monitor the progress towards this goal, to find associations between health events or variables (e.g., trigger of a

symptom) [28,29], to take action or change behavior (e.g., change diet and exercise to improve glucose levels) [42], and to share information with health providers [2,11,50].

Most studies concerning self-tracking focus on the activities people perform [33], the reasons to track and abandon [17,19], and how tools support users' reflection and goals [34]. In this section, we describe how the literature approaches the link among data, reflection, and the goal. After that, we explain how HCI literature on self-tracking discusses how data and tracking activities relate to users' emotions, with a particular focus on the health domain.

2.1   The data-reflection-goal link

Multiple models exist and shape our understanding of how self-tracking takes place. In these models, three aspects deserve closer attention: the data, the reflection process, and the goal as well as the connections among them. In general, many studies show that the basic self-tracking premise is that with *data* people will be able to *reflect* on and positively manage their lifestyles. For example, Li et al. [33] proposed the most used model of self-tracking: the stage-based model of Personal Informatics systems. It is composed of 5 stages: (1) *Preparation*, involving planning and preparing to track; (2) *Collection*, comprising gathering data; (3) *Integration*, encompassing formatting and combining data from different sources; (4) *Reflection*, encompassing reflecting on the data; and (5), *Action*, comprising acting based on the reflection. According to the authors, the core stages are collection and reflection [33]. This view emphasizes the direct connection between data and reflection.

In another study, Rooksby et al. [50] criticized the Personal Informatics model and introduced the concept of "lived informatics," emphasizing that personal tracking is embedded in people's daily lives. They argue that tracking activities are not "dispassionate" data analysis endeavors but are instead deeply embedded in emotional aspects of people's lives. Epstein et al. [19] use the reflections of Rooksby et al. [50] to propose an extension of the Personal Informatics model [33]. In this extension, they divided the preparation stage into *deciding* to track and *selecting* tools; they characterized collection, integration, and reflection as an ongoing process they called *tracking and acting*; and they added two other stages to describe interruptions in tracking activities: *lapsing* and *resuming* [19]. While this extension approaches tracking activities and how they are embedded in people's daily lives in a less idealized way, it does not deeply approach the emotional aspects Rooksby et al. [50] pointed out in their discussion. Rather, it focuses on the different goals people may have when tracking, how these goals and their related practices change over time, and the reasons for abandoning tracking activities.

Similar to Epstein et al. [19], other studies approach different types of goals people may have when self-track (e.g., behavior change [33], curiosity [50], fascination with numbers [50], self-experimentation [28], disease management [42]). However, the goal itself is usually seen as positive and achievable. Many studies tend to focus more on the tracking activities [11,14] than on the emotional context surrounding data, reflection, and the link between them. These models main focus are on describing the main activity stages of self-tracking and how to better support them. Rooksby et al. [50] offer a more in-depth discussion about how personal tracking is embedded in the emotional aspects of people lives. These aspects call attention to the emotional component that is part of the self-tracking process, its relation to the goal, and how it influences the engagement of people with their data and with tracking activities. This emotional component is especially important when this engagement seems to reinforce or exacerbate negative consequences. In the next section, we describe studies that discuss different consequences, more negatively loaded, for this process.

2.2   Self-tracking and the possible negative emotional load of data

In the HCI community, a few studies have discussed the emotional load of data and its impacts, and some of them present consequences that were not the original intent of the activities.

Ancker et al. [2] aimed to understand how patients with multiple chronic conditions track and perceive their health data. They explain that personal data can be charged with strong moral and emotional implications: indicators such as blood glucose and weight carried moral values, and patients judged themselves as "good" or "bad" based on their results [2]. They also argue that this type of data often reminds patients about their diseases and all the negative aspects related to them.

Concerning food tracking and emotional load, two studies stand out. First, Cordeiro et al. [13] describe how some people experience feelings of guilt or shame when journaling food: by tracking food, they feel unhealthy and judged. In a similar direction, Eikey and Reddy [16] studied the use of weight loss apps by women with eating disorders and found they feel guilt and shame when exceeding their calorie budget. They argue that, although these apps can be useful in helping people that need to lose weight, they may also create a dependence on logging, promoting unhealthy eating and exercising behaviors, especially for at-risk populations, calling attention to the possibility of obsessive tracking.

Similarly, in a study about diabetes apps, Katz et al. [30] discussed how people facing difficulties in controlling their glucose levels can feel vulnerable and seeing data that may suggest a "failure" can increase negative feelings, such as stress and guilt. In another related study, Ayobi et al. [3] explored the use of self-tracking for patients with multiple sclerosis. They explain that self-tracking contributes to feelings of regaining control when facing such a complex disease; however, self-tracking focusing solely on symptoms can also trigger feelings of hopelessness [3]. The authors also draw attention to the need to address the emotional aspects of people living with unpredictable and degenerative diseases, such as multiple sclerosis [3].

Other possible negative aspects have been approached by other communities, such as humanities and social sciences. These communities often discuss quantification issues, such as the loss of meaning after the creation of numeric values, the authority of numbers, the conflation with statistical normal, and the reproduction of power relationships [20,26,38,45]. All these studies suggest that people likely have both positive and negative experiences and emotions when collecting and making sense of their data, which indicates that people interact with and is impacted by their data in different ways. In sum, these studies suggest that the self-tracking process and the link among data, reflection, and goals may not always be a positive one.

Understanding the positive and negative emotional aspects around engaging with self-tracking data and activities is critical in the context of health because users' emotional experiences affect 1) their mental and physical health, 2) their self-tracking practices and their outcomes, and 3) their commitment to self-tracking activities, e.g., routine use [21] or abandonment [12,17]. In this paper, we analyze one specific, complex, and emotionally loaded use of self-tracking –fertility self-tracking – to better understand how self-tracking activities and the emotional context in which they are embedded characterize the different ways people engage with their data.

3   CASE STUDY: FERTILITY SELF-TRACKING

Fertility is a complex aspect of women's health. Many variables can impact an individual's fertility and increase or decrease the chances of conception [7]. Effective fertility treatments are tracking-intensive endeavors that require continuous monitoring of a wide range of health indicators, often through self-tracking. Despite that, the final goal (i.e., conceiving) may not be achievable through self-tracking or at all. It increases the emotional load already present in the context. These aspects make it an ideal empirical setting to analyze how the emotional context influences tracking activities and people's engagement with data.

3.1   Fertility self-tracking

Self-tracking is used in fertility to increase the chances of conceiving by timing intercourse with the ovulation period. All tracking activities are performed first to identify the fertile window (days around ovulation) and second to identify the outcome: if the woman got pregnant [14]. Self-tracking can help women to understand the specificities of their cycles: estimations based on their measurements increase the chances of identifying patterns that can be useful for fertility treatments. It may also contribute to a feeling of agency and control [3,46], helping individuals deal with the inherent uncertainties involved in trying to conceive a child.

Different measures can estimate ovulation through self-tracking, but all of them have limited precision and cannot alone pinpoint ovulation precisely. Instead, women need to collect, integrate, and reflect on different measures to identify the likely time of their ovulation. Some of these measures are ovulation predictor kits (OPK) results, cervical mucus, and basal body temperature. OPKs measure a rise in the Luteinizing Hormone (LH) *before* ovulation. A positive result indicates that ovulation will occur in the next 12-36 hours. Cervical mucus is a discharge produced by the cervix that changes volume, color, and texture throughout the cycle. *Before* ovulation, it becomes thin, slippery, and stretchy. Basal body temperature, the lowest body temperature, needs to be measured daily, at the same time early in the morning. The day *after* ovulation, it rises by 0.5-1 degree Fahrenheit and remains high if pregnancy occurs. The description of other measures can be found in [14]. Women using tracking while trying to conceive observe each of these measures to estimate their ovulation. Besides ovulation, women also use self-tracking to find out if they have conceived. In this case, most of the indicators are based on symptoms or home pregnancy tests.

3.2   The emotional load in the fertility context

Self-tracking for fertility is complicated due to many factors, but primarily because it is a personal and uncertain situation [14]. Complexity and uncertainty increase the emotional load of fertility. Few studies have described aspects of this emotional context. One recent study [18] analyzed the use of menstrual apps. It was not directly focused on conceiving, but its findings are related and relevant to note. The authors describe negative feelings that may arise due to issues in the design of the apps, such as the feeling of not being a "normal woman" by the assumption of the user gender as female. Another study [36] analyzed the emotional aspects of pregnancy through videos and comments on a YouTube channel focusing on conception. The authors found negative aspects that may be connected to pregnancy, such as the experience of guilt and judgment when one is or isn't able to conceive [36]. Taking a different approach, Almeling and Willey [1] explored how people have different bodily experiences when facing in vitro fertilization (IVF) treatments depending on the reasons they were doing the treatment: for getting pregnant or for egg donation. They found two types of bodily experiences, one more and one less intense. Based on their analysis, they propose that the reason for undergoing a health intervention is a significant source of variation in bodily experience [1].

These studies shed light on the emotional load of fertility, but they do not explicitly explore the role of self-tracking in the fertility process. Another study [14] focused on self-tracking activities and its emotional aspects, describing the challenges women face when self-tracking fertility and discussing how its personalized characteristics increase the difficulties and prompt women to turn self-tracking into a collaborative activity. The study also briefly approached the emotional experiences of women when self-tracking for fertility, but it does not explore how women may have different relationships with their data and how these relationships impact and are impacted by the activities they perform. Understanding the way different people experience self-tracking activities with different emotional experiences is important to support these activities while avoiding negative consequences. Our study focuses on exploring these experiences by analyzing the broader emotional load of self-tracking for fertility. We focused on

the different types of relationships with data and the related emotional experiences in such a complex context.

4 METHOD

This study is part of an exploratory research project using online health forums to collect data on the relationship between self-tracking and the emotional experience of infertility and fertility challenges. Online health forums provide a platform for users to ask questions and receive answers and support (usually from peer patients) for many different types of conditions. Such forums are particularly suitable for our analysis because many women who are trying to conceive through fertility awareness methods are not monitored by physicians, so they cannot necessarily be identified through medical visits. The forum allows us to approach the concerns of women using different fertility treatments, with or without the monitoring of a provider. They also provide in-situ data of people reaching out while living that emotional experience. The forum we selected has a specific community for fertility, which focuses on women in different stages of fertility treatment, from fertility awareness methods to IVF. In this study, we use the terms "woman" and "women" in our discussion of women's health issues following the general use of women's health in the HCI community [18]. Because our focus is fertility, these terms often refer to individuals who are tracking indicators in an attempt to get pregnant. However, this does not mean all women self-track indicators specific to female biological sex for fertility.

4.1 Data collection and analysis

We selected one specific health forum due to its popularity and the granularity of the fertility community (i.e., specifically focused on those who have been trying to conceive for a year or longer, not on general conception and without separation by treatment type). All the data used in the research was publicly available since the forum does not require login and allows data collection for research. We received IRB approval for our study concerning patients' challenges. Nevertheless, we consulted the IRB office concerning the use of forum data. We were informed that this data is considered public and no modifications to the IRB were needed. However, because we understand the potentially sensitive nature of the posts, we decided to take more measures to maintain users' privacy: we will not identify the forum, the quotations we use were modified (e.g., punctuation, grammar, typos) without changing their meaning, and we verified that the originals could not be found with simple searches.

We downloaded all threads until September 2016 and selected relevant ones by using a query to retrieve information from the database. To do that, we first analyzed a few threads to create a list of keywords. Since we were interested in self-tracking activities (using or not technological tools), in this stage we used specific terms such as "fertility tracking," "ovulation tracking," and "cycle patterns." We did not restrict the query to technology use because self-tracking may or not be performed using technological solutions. However, the act of self-tracking in general can inform technological tools, which is part of our goal. We iteratively developed a query by analyzing the relevance of sets of threads and improving the search criteria. The final query included words related to health indicators tracked in fertility treatments (e.g., period, temperature), the activity of tracking (e.g., tracking, charting), tools used for tracking (e.g., OPK, conception kit), and combinations of them. The final terms are related to the main tracking aspects of fertility and were selected after analyzing the content of significant threads to understand how women discuss the subject in the forum. The query resulted in 3,527 threads with 15,944 answers, from 2006 to 2016.

We then performed a three-stage qualitative analysis. First, to gain an initial understanding of the infertility issues women raised in the forum, two authors of this paper independently coded the 100 most recent threads and their 377 answers (from 2013 to 2016) using an open coding technique [53] to identify the main aspects presented in the data. The researchers

discussed their results and defined a broad and open codebook to be used in the next stage. Relevant new information found in the following stages of analysis was incorporated into the coding scheme. Any disagreements were resolved through discussion. In the second stage, we randomly sampled 500 threads from 2006 to 2016. The questions and answers were analyzed by the same two authors and a third researcher using the initial codebook. The codebook was continuously modified whenever new themes emerged from the data until theoretical saturation [53] was reached. We reviewed 400 threads (300 randomized + 100 most recent), a total of 1963 posts including responses, before achieving theoretical saturation.

The first two stages of data analysis revealed that emotional aspects are critical in fertility self-tracking, so the third stage explicitly focused on the emotional component of the tracking activities. The first author recoded all the reviewed threads analyzing the emotional aspects previously identified in the data. This analysis followed two steps. First, the researcher categorized the feelings expressed in the quotes (e.g., anxiety, hope, frustration, happiness, anger, depression). At this step, the differences in the emotional relationship with self-tracking data and activities emerged. These differences seemed to configure different levels of emotional intensity, from positive engagement with self-tracking activities and data to a point where women were so overwhelmed by negative feelings that they could not do it anymore. In the second step, based on these feelings and their relationship with the tracking activities, the researcher categorized the quotes into five different types of engagement: positive, burdened, obsessive, trapped, and abandoning. These categories represent the different levels of intensity we found in our data and will be detailed in the next sections.

5 FINDINGS

In coding the emotional aspects related to the self-tracking activities, five types of subjective engagement with data emerged: positive, burdened, obsessed, trapped, and abandoning. These categories describe the varying, and emotionally laden, relationships with data that women exhibited in the forum. Fertility can be an emotionally-loaded context, so many of the emotions we describe could be experienced without tracking. However, we describe how these emotions impact tracking activities, and how tracking may, not necessarily cause but influence, reinforce, or exacerbate the described emotions. The following subsections describe these types of engagement as well as the main emotional characteristics and tracking activities of each of them.

5.1 Positive engagement: Excited with data

When they experience positive engagement, women have a positive attitude towards self-tracking and data. Often occurring at the beginning of a fertility process, women within this type express positive engagement with the tracking process and are learning the measures and practices associated with tracking. These women express excitement upon seeing data and trying to understand what the data mean. For example, in the following quote, the woman is excited to see her "darkest line" on the OPK. Having a line darker than the control line in an OPK (ovulation predictor kit) means that the woman will ovulate in the next 12-36 hours. The line this woman is seeing is not darker than the control, but it is the darkest she has had so far. Although it is not a positive result, it gives her a feeling of progress, which encourages her to continue the activity, as illustrated in the quote:

  "Do you think I should test again tomorrow and the following 2 days? This is exciting!"

When women are in a state of excitement, self-tracking can foster a feeling of control about the fertility process. Tracking data provides a structure that enables women to make plans about how to deal with their fertility challenges. Further, tracking is expected to guide behavior in a manner that increases the chance of pregnancy. For instance, in the next quote the woman describes her current practices and how she is preparing for the next year:

"I had a similar experience last month, so it is not bothering me yet. I keep having sex every other day and measuring my temperature too. I even bought a year membership in [a fertility tracking website] in order to use all available tools. I am ready for the long journey!"

These quotes exemplify a positive engagement with tracked data, in which women are tracking their data, feel that they can make sense of these data, and have a sense that if they use these data, they will be able to achieve their goal. Although stress and anxiety are present in any kind of engagement, women who enjoy positive engagement generally orient to data with hope and excitement.

5.2   Burdened engagement: Concerned with data

In the second form of engagement with data, women express a higher degree of stress and anxiety with tracking practices. For these women, tracking can be more emotionally demanding. For example, the woman in the following quote describes how she feels pressured to get positive results (i.e., anxiety) and it may be even impacting in her cycle:

"I feel somewhat silly, but I wonder if there is any other woman who experienced anxiety when first started charting your ovulation and cycle? My cycle was absolutely predictable until the DAY before we began discussing about starting to use OPKs to figure out ovulation and etc. Now my cycle seems to be completely over the place. With my partner's previous child, they had to pass through fertility treatments, so now he wants to be more relaxed and to look for patterns before trying to get pregnant. It is almost as I am getting stressed because I want to show that my cycle is predictable."

Women who experience a more burdened engagement with data use language that suggests a more intense focus on tracking practices and concern with regards to tracking behavior. Often these women describe wanting to understand their measures better, so they can track and reach a more precise understanding of their cycle. So, they start to collect, check, and re-check measurements frequently. For example, the first woman in the following dialog excerpt is trying to understand how the basal body temperature works and how much it oscillates so that she can identify the changes with more confidence, while the second one explains all the experiments she made in order to better understand her patterns:

"A: Has anyone ever tried to take the temperature later in the day to see how much higher it gets after walking, living, and so on? Do you think it should be close to the temperature when you wake up? I know it is important to measure it before leaving the bed because it rises, but I wonder if anybody knows or tested how much it usually rises?

B: My temperature is very sensitive to the moment I measure it and to the temperature of the place I am in. I discovered that if I measure my temperature some few hours later than I normally do, or if I stand up before measuring it, it can be around 0.5o higher. Other activities also seem to make a relevant difference, e.g. eating, talking, and drinking. This makes it harder to have an accurate temperature after leaving bed. Many times, my temperature was more than 0.5 lower during the evening than in the morning. I think these differences must be due to changes in my mouth temperature after drinking or eating."

Here we see an example of how the act of tracking data can become burdensome – particularly as women attempt to understand with a high degree of specificity measurements that are variable and often unpredictable. In this state, women express the desire to increase the amount of tracking behavior to get more measurements and improve their readings. As described before, no single measure pinpoints the exact day of ovulation; there are only different measures that give clues on when it will (or may) occur. Thus, women who experience a burdened engagement with their data tend to look for more measures in the attempt to get more precise results. However, although such activities may increase the chances of conception, achieving such precision is not straightforward. The woman of the following quote has decided to include cervical mucus in her tracking, but she is not sure how to interpret their data:

"I am trying to understand everything I can about cervical mucus, so I can track it, but my body
is not consistent with the data. My menstruation ended 4 days ago. Since that, I am having a lot
of watery mucus. Shouldn't the mucus be dry (based on all I read)?"

Our data suggest that some women experiencing burdened engagement with tracking have been tracking for some amount of time without conceiving, and have typically sought other measures to complement what they have been doing. For example, in the previous two quotes, we saw women trying to discern intricate temperature patterns, and adding cervical mucus to their tracking regimen.

As another example, a woman explains the patterns she has identified after tracking for 2 years, which demonstrates that she understands her cycles. Yet, she has not conceived. So, she is trying to find answers, and she is even considering menopause, which is not common for a person of her age:

"I am tracking my cycles for around two years. I have noticed a pattern: I have one 55-days cycle
followed by a 45-days one. I'm ovulating typically between cycle day 23 and cycle day 33. My
luteal phase lasts around 13 to 14 days every cycle. I have intercourse when the ovulation
predictor kit is positive [...] I have read somewhere that it could be menopause, but I am only 23
now. Any ideas?"

Regardless of time, not achieving the goal can increase anxiety (after months for some, years for others). Further, the anxiety becomes a central part of the experience of tracking. Women describe planning their schedules around tracking activities and getting upset when things do not go as expected – thus increasing stress. This cycle is apparent in the following excerpt, in which the woman described being anxious because she has not been able to keep to a precise tracking schedule.

"I measure my temperature at 5:30 in the morning. The past 2 days I have been totally exhausted,
and I over slept. Yesterday, I did not measure my temperature until 6:30 and today I did it only at
6:50. Do you think I screwed up my temperature chart?"

The stress experienced in a burdened engagement with tracking can affect those who are not directly engaged in self-tracking. The following quote is a compelling illustration of the stress that can emerge as women, and their partners, begin to live in terms of these data.

"I was very sick this week, but we had intercourse on Tuesday and Wednesday. Then on
Thursday I got a positive OPK result at work! [...] I could only go home at midnight. [...] I
actually did not want to do it [have intercourse], but we needed to do it. I feel really frustrated. 2
months waiting for this result and in the day: nothing! Do you think I can still have a positive
result today? [...] I believe my partner felt really bad about it… I feel really bad [...]"

Despite expressions of frustration, anxiety, and stress, women who are in a state of burdened engagement maintain a generally positive orientation to the tracking process, as illustrated by the advice provided by the woman of the following quote.

"Try to just enjoy the journey. Avoid overthinking and stressing. Tracking is awesome but
sometimes it makes you think and stress so much about tracking that you do not even notice you
are adding stress to your body. Just enjoy!"

These women have hope and feel that tracking will eventually enable them to get pregnant. The next quote exemplifies this attitude.

"I am trying not to stress now that I am already trying for 7 months. Everybody tells me it will
not happen if I keep trying [so hard]. And I think: what the hell! So, I suppose we cannot control
it for real, but we can try to increase our chances as much as possible."

5.3 Obsessive engagement: Consumed with data

When women are in a state of obsessive engagement with self-tracking they are consumed with self-tracking activities and data. Women in this state express frustration, anxiety, stress, and begin to feel hopeless, as exemplified in the case of the following quote.

"My doctor did not find anything wrong in my blood tests. I thought I did everything right:
timing, OPKs, intercourse on the right days. Please can somebody tell me how can I get

pregnant? Does clomid [a medication to stimulate ovulation] truly work? If the doctor says my levels of progesterone are fine, should I try to make him make me a prescription anyway for extra precaution? I also tested my vitamins B and they are normal. What can I do next? Please someone help me, it is so heartbreaking to try month after month with no success."

As this and the following quotes illustrate, the measures become the focus of attention in this state of engagement with self-tracking. Women track multiple things and select the ones they will deposit their hopes in case the others give not encouraging results. They also start seeing any symptom as a possible measure to track. Since fertility is uncertain and there is no definitive measure to use, women are continually looking for other measures that can give them hope. This behavior is seen more often when women track to find out if they are pregnant, as exemplified in the following excerpt:

"I understand that most of the women do not have symptoms until after the menstruation is due. I want a positive result so badly that I am searching for any little pain or irregularity to give me hope. You understand how it works! I will test tomorrow. Pregnancy tests are typically accurate though there are many exceptions."

Along with obsessing, over-tracking, and searching for new ways to track, are examples of women attempting to repurpose existing tests in the hopes of getting a hopeful answer. In the next excerpt, the woman is using an OPK, which is a tool to identify the probable period of ovulation, to test for pregnancy, assuming that it would show a positive result in this case as well. This is not the only example of women trying to use OPKs to test for pregnancy. This attempt is based on similarities between the hormones OPK and home pregnancy tests detect (LH and hCG) [10]. However, the OPK was created to identify an increase in the LH, not the presence of hCG. So, any result it can give is not confident concerning pregnancy, since it is more likely that it is identifying changes in the LH levels.

"I had this crazy thought: can I be pregnant? My menstruation lasted only 2 days last cycle. There is NO WAY I could be pregnant, so I believe I am officially crazy. I am tempted to get a cheap pregnancy test just to stop thinking about it. But that is so dumb! I used an OPK last night and the result was negative. It would be positive if I was pregnant, correct? I guess that when you want something SO BADLY, your mind will find a way to go to this crazy space. I am so tired of the waiting..."

Finally, in obsessive engagement with tracking, we see women start to interpret symptoms in their bodies as signs that they might have conceived. There is a condition known as false pregnancy in which the woman feels pregnancy symptoms although she is not pregnant. In such a scenario, which can occur completely separated from tracking activities, tracking may be used to reinforce these feelings. For example, the woman may focus on trusting the symptoms they are feeling as indicators of pregnancy, ignoring, for example, the pregnancy tests results. In this sense, they may play with the uncertainty of fertility to find reasons that support their feelings and give them hope.

"I swear I have made myself feel pregnancy symptoms before. My menstruation was late for 4 days, my breasts were swollen, I was very tired. I was having negative results in pregnancy tests, but I convinced myself that I was pregnant. I read that you can do this type of thing with your mind and then your body follows the symptoms, but you are not pregnant. The mind is a really powerful crazy thing."

Women in this state are consumed with their data in a manner that is emotionally draining. They express frustration, anxiety, and eventually even despair. However, they have not entirely given up hope. In fact, these women keep trying to find reasons to have hope – even if such hope is coming through a paradoxical relationship with the data. The following woman makes sense of "bad" temperature charts through a lens of disheartened hope – if prior good charts did not lead to achievement of the goal perhaps bad charts will?

"Today is the 15th day after ovulation. My temperature chart looks really bad, it is the worst I ever had. But, on the other hand, I had a bunch of beautiful charts that turned into negative

results. I cannot believe I handled this long without my much-loved pee sticks. I am 99% sure it will be another negative result. But, there is that lone 1% provoking me."

These women are consumed with data, finding new forms of data, and interpreting their data. They have not given up on the power of self-tracking to help them achieve their goal.

5.4   Trapped engagement: Ensnared within data

While the prior form of engagement is the most tracking-intense, trapped engagement is the most emotionally intense relationship with self-tracking. These women have generally tried to conceive for some time, explored different measures and activities, to no avail. Often, they express a mixture of guilt and despair – as if something is wrong with them. The next quote shows an example of this state of mind:

"I need any sincere advice, because I feel I am getting more depressed with the time passing by. [...] I am formally tracking my temperature, using OPKs and everything else since the beginning of this year [...]. I am sure I am ovulating, my cervix is high, I have a lot of mucus, and I have positive OPK results. I have sex every day, every month, during the fertile period, and 2 to 3 times a week in the remaining of the month. We are doing all things right. What is wrong with myself? [...] I feel I am losing my mind. I am crying all the time. People in my circles are getting pregnant with no problems, and I am here, every month, with one more disappointment. Please someone give me an advice, tell me any detail that can help me figure out what is wrong with myself [...]."

Women in a trapped relationship with self-tracking often express a desire to stop tracking, but they feel as they cannot. They are dependent on these activities. They are tracking everything they can and not conceiving. They feel emotionally overwhelmed and depressed. Yet, they persist in tracking:

"I want to stop trying so badly, but I just do not think I can forget about all this. I seriously do not believe I can refrain my brain from thinking 'today is the 10th day of my cycle, I should have sex, and so on'."

This engagement is extremely emotionally loaded. These women regularly use a language of depression, and some describe avoiding contact with other people. The pressure to stop tracking appears to intensify the inability to get out of a relationship of ensnarement with their data. These negative feelings are illustrated in the following excerpt:

"We have been trying to conceive for the last 2 years without any luck. I have become depressed and obsessed with all that. [...] We finally look for a specialist in IVF and did multiple types of test only to be diagnosed with unexplained infertility. That did not help me at all. [...] Everybody say that as soon as I relax and stop thinking about it I will get pregnant. It is easy when you already achieved what you desire. Some days it is so hard to me to even leave the bed, because I am really sad about all this."

Although these feelings are likely to exist without the presence of tracking activities, self-tracking may reinforce them. The health indicators in fertility are only proxies to achieve the goal, having "good" data does not guarantee conceiving. In this sense, seeing and interacting with the data may make the difficulty or inability to conceive more visible, increasing the sense of failure and despair, as well as reinforcing the feeling of not being "normal."

5.5   Abandoning Engagement: Rejection of Data

The final type of engagement is a stopping point: tracking has become so onerous and the emotional costs of a new frustration month after month so devastating that women declare that they will stop tracking and trying to conceive (at least temporarily "take a break"). It may be temporary, as in the case of the following quote.

"I tested twice this morning, once with a test you get in the internet and once with the Clear Blue Easy digital. Both with negative results. Apparently, my temperatures are dropping again [...], so I am very sure my period is coming. Everything looked so right and on time on my

chart. Thank you all for the support, but I am stopping this for a while. I cannot handle the obsession and the stress anymore, so I am not trying for at least 3 or 4 months."

For many women who have come to the point where they need to abandon their engagement with self-tracking, the break is indeterminate or permanent. These quotes are often phrased as coda; outlining an emotional journey and saying goodbye:

"After 3 medication cycles I feel sad to say that I was not able to conceive. I have been trying for 8 years but no luck. I BELIEVED clomid would be my 'magic solution' but after all the stress, constant worrying, tracking temperature, having intercourse on time, visits to doctors, blood tests, and medications I just decided I needed a break."

Here we see women describing how they end their relationship with data and self-tracking. Through this break, they can explore other ways to achieve their goal. The next quote shows an example of this emancipation from such a negative relationship with data:

"I tried to conceive for 7 years and my last failed IUI was a month ago. After this one more heartbreak me and my partner decided to adopt a child. I am feeling a bit better now that I know I will become mother through this other path. I will miss the experience of the pregnancy but I think I will fill this empty place when I have a child."

In many of these cases, abandoning data tracking seems to be intertwined with abandoning trying to get pregnant (i.e., their goal). This highlights the complicated relationship between the tracking activities, the goal, and the emotional experience in a context where the link between these issues is problematic (i.e., the goal may not be achieved, tracking may reinforce negative behaviors, and the experience is very emotionally-loaded).

5.6   The components of engagement: Actions end emotions

The five distinct forms of engagement with self-tracking data and activities revealed different orientations to data and the concomitant emotional experience of tracking. Our analysis suggests that each type of engagement has two components: actions related to tracking and the emotional experience of tracking and reflecting, as outlined in Table 1.

Table 1. The different components of engagement with data

	Positive	Burdened	Obsessive	Trapped	Abandoning
Emotion	-Excited about tracking -Hope, plan, agency	-Some stress/anxiety -Frustration -Increased focus -Some affect in relationship -Still mostly positive	-Obsession -Full and selective trust in measures or blind hope	-What is wrong with me? / Guilt -Reclusion Depression	-Cannot handle it anymore
Action	-Learning to track -Seeing data -Becoming competent in understanding data	-Increase tracking -Impact in schedule -Wants to try different measures -Wants to try different treatments	-Obsessed with data -Manipulating measures -Measures take over other feelings	-Dependent on tracking and data	-Stop or take a break

Actions and emotions are intertwined and mutually dependent: they progress together and influence each other. Women tracking for fertility with the positive and burdened types of engagement can experience adverse effects, but their relationship with data is still mostly positive. They are learning to track, seeing the data for the first cycles or getting competence on reading them, trying different measures, and trying to understand how to navigate such a personalized condition. These activities are performed within and reinforced by positive emotions, such as hope and the feeling of agency. However, the three final forms of engagement (obsessive, trapped, and abandoning) present a more delicate or problematic relationship with

data. The obsessive engagement is very tracking-intense, and the measures and tracking activities dominate the emotional response. Some women may obsessively track even more measures trying to increase their chances, getting so deep in the tracking activities that they become their primary focus. This is a relationship that may not be sustainable. The intensity of the components is flipped in the trapped and abandoning types: the emotional component is more extreme and dominates the tracking activities. Within the trapped engagement, many women feel desolated for having repeated frustrations every month, but they keep tracking. In this scenario, pregnancy is seen as the only success possible, everything else is seen as a "failure." Through the quotes, we can see that some women internalize the "failures," believing that something is wrong with them or their bodies or that they did not do everything they could. Finally, the last type of engagement is as reaching a stopping point: this engagement is so negatively loaded that it becomes unsustainable to them and stopping, unlike often in the other types of engagement, becomes a more concrete option. While there are different types of abandonment [17], our findings highlight abandonment that results from negative feelings (similar to [16]).

These data suggest that stress and anxiety are generally present in all types of engagement. However, in the different categories of engagement women experience these emotions with varying intensity and with more or less hope and excitement. Fertility struggles are inherently emotional and stressful, whether or not a woman chooses to engage in self-tracking. That said, these data suggest that tracking can add complexity and even intensify stress.

6 DISCUSSION

In this section, we first discuss the interplay between tracking and emotions, and then we highlight how this interplay was made visible through the forum. Then we discuss the broader social and cultural context that influences the practices of self-tracking. Finally, we discuss implications derived from our results.

6.1 The interplay between tracking and negative emotions

In the findings section, we described five different types of engagement characterized by the interplay between women's fertility tracking activities and emotional experiences. This interplay is reciprocal, as the emotional response and the tracking activity influence one another. Literature has found that self-tracking contributes to a feeling of agency, especially for people facing complex conditions [3,46]. We found similar results in fertility, especially in the context of the two first kinds of engagement (positive and burdened). However, fertility is complex and uncertain, and it is not possible to guarantee the desired outcome. These characteristics impact and limit the sense of agency. When women experience uncertainty and a lack of agency, tracking can enhance or reinforce strenuous and unhealthy relationships with data, and women can then experience emotional distress.

The negative emotions described here (e.g., stress, anxiety, obsession, depression) are likely not caused by tracking. These negative emotions and behaviors likely often appear when people cannot reach emotionally-loaded goals, regardless of whether the person is performing self-tracking activities or not. In our scenario, self-tracking is potentially contributing to the aggravation. Well-known characteristics of self-tracking data can contribute to this aggravation. First, the indicators in fertility tracking are not direct measurements of ovulation. For example, OPKs detect an increase in the LH hormone that usually happens 12-36 hours *before* ovulation. Second, such measures are not exact. The data can give contradictory or ambiguous results, particularly given the subjective nature of some measures (e.g., symptoms and quality of cervical mucus). Further, aligned with the discussion of Ancker et al. [2] about the moral load of glucose results, our study shows that data is not neutral and can have strong moral and emotional implications in sensitive contexts. Based on their data, women asked if they were

"normal" or "what was wrong" with them because "good" data and the measurements did not lead to the expected results.

Katz et al. [30] described how seeing data that suggests a "failure" can generate stress. Similarly, we found that tracking without achieving a positive result contributed to anxiety and stress. Our findings suggest that the nature of the goal, in our case pregnancy, is related to intense forms of engagement with self-tracking and the emotional reactions to not reaching the goal. Li et al. [34] suggested that personal informatics should be used to set and achieve program-level goals: specific and concrete activities that can be performed through a sequence of actions. However, for many women, conception may not be achievable through tracking or at all. As women get frustrated with their tracking activities not leading to the goal, they are pushed into more intense and negative relationships with tracking and fertility. Our data suggest a feedback loop between one's perceived ability to achieve a goal (or to move towards it) and the subjective experience of self-reflection around data.

6.2   Visibility in a social context

Although self-tracking may seem to be an individual activity, it is often a social one. Rooksby et al. [50] describe tracking as social and collaborative, highlighting that often people do not track alone, but with friends, family, and coworkers. Previous studies have approached tracking in a family context [4,49], have considered caregivers [54], and other actors that may be impacted by the activity [25]. In the context of fertility tracking, often at least two people are involved. While our data show that tracking is primarily done by the women trying to get pregnant, their partners are also involved in trying to conceive, and they are affected by women's emotions and actions.

Further, women's experiences were partially situated in the online forum, where they interacted with others, asked questions, and supported each other. It made the relationship between tracking and emotions more visible. Previous work regarding online fertility forums has found that women engage in collaborative sensemaking to understand and reach conclusions based on their fertility self-tracked data [14]. In addition to sensemaking, these forums allowed individuals to express emotional struggles and garner emotional support, which is essential for them given the emotional burden involved and is often missing in self-tracking tools. Without the context of their emotional experience, tracked data is not enough to observe their pattern of engagement with data, including how their emotions affect their tracking and vice-versa. Our findings suggest that this interplay between emotions and tracking is an important piece, influencing women's experiences and actions. Thus, this research emphasizes a need to support social and emotional aspects that are inherent to many health contexts (especially emotionally-laden ones like fertility) in which people self-track. As discussed by previous work, this support can take place through communities such as the forum studied in this project [14,32]. However, we should also consider how self-tracking practices and tools themselves can support meaningful social practices and emotional contexts. For example, how might we combine individual self-tracking practices and collaborative emotional support? Research has shown that those with a higher sense of belonging to a virtual community experience less physical health symptoms and stress [55]. Therefore, finding ways to leverage visibility and community support is a possible strategy to help alleviate the negative emotions inherent to infertility and avoid exacerbating them through self-tracking practices.

6.3   The culture around self-tracking

Self-tracking tools and activities are embedded in a broader socio-cultural context. Lupton [40] states that digital technology tools are "sociocultural products located within pre-established circuits of discourse and meaning," participating in the shaping (and reshaping) of human bodies and selves. In this sense, tracking is immersed in broader social phenomena, such as empowerment and agency, motherhood, and the quantified self movement. With the uptake of

self-tracking activities and technologies, the individual's role in her health is shifting. Increasingly, responsibility for health management is seen as an individual matter [51]. Although this shift can be empowering and give individuals a sense of agency, it also may create new demands for individuals to take responsibility for their health. They are not only expected to observe and track indicators but also to act on their observations and data, which may inadvertently disempower individuals by making the process feel required and completely within their control [39]. In the context of fertility, this is further exacerbated by cultural pressures and standards around gender roles, motherhood, and the ability to conceive [15,56], which have been discussed before. For example, Becker and Nachtigall [5] describe the culture around infertility by stating:

> "A central theme of American values, persistence has been demonstrated for persons seeking medical solutions for a range of conditions. Doing 'nothing' is equated with the failure to take responsible action, whereas doing 'something' is viewed as leading to the betterment of a given situation."

In this way, not just action but *persistent* action is the dominant narrative when it comes to trying to conceive [5,32]. This determination and persistence, as Lee [32] describes, is a common and often celebrated notion of many narratives around infertility. Additionally, there is "cultural faith" that this persistence will ultimately pay off (i.e., lead to the conception of a healthy child) [5]. This belief may also be reinforced by self-tracking tools and technologies that emphasize the role of consistent tracking in goal achievement. Although some women may feel discouraged and overwhelmed when their tracking activities seem not to help them achieve their goal, they can try to "double down" the tracking in an attempt to "fix" the problem they are facing. Even though the issue is often unidentifiable (either entirely or by tracking), they continue to engage in tracking. Self-tracking then is a way of "doing something" and persisting. Tracking more indicators for more extended periods of time fits into this cultural notion of persistence in fertility, which may influence the complex relationship between tracking and the more negatively-leaning emotional engagements with data.

This persistence exists in a culture of quantification, which has its own issues, such as data authority, loss of meaning, reduction, and classification [20,26,38]. These issues are relevant to the fertility context we described here because of the many different factors that impact fertility [7]. This variability is simplified (and needs to be simplified) to create the measures that make tracking possible, such as OPK, temperature, amount and quality of mucus. Measuring and quantifying countable objects or events is usually much simpler than quantifying a bodily phenomenon. The latter will always be a reduction, a partial representation of a person or observation in data, not the whole person or observation [45]. However, after the creation of these measures, they and their combination may acquire an authoritative role: they can be seen as the exact representation of reality and the self [20]. A clear example is a positive result in an OPK. It means that the level of LH exceeded a pre-defined generalized measure. However, it is often read as objective proof of ovulation and fertility. People often grant this type of authority to numbers, due to many factors, including numbers' sense of accuracy and validity as well as their association with objectivity and rationality [20]. Despite the real limitations of quantifying aspects of the body, body data is often viewed as objective and separate from uncertainties and is therefore seen as a neutral, scientific, and direct measurement of the body's state [39,47].

All the mechanisms and approximations used to quantify each health indicator involved in fertility disappear behind the final 'number' [20,26,52], which is used as a proxy for fertility 'status'. According to Espeland and Stevens [20], when something is quantified, it becomes easier to conflate "normal" as in statistics (shape and properties of measures said to follow a normal distribution) with "normal" in a moral sense. Norms and specific numbers become ideal goals that indicate if someone has attained "good" or "perfect" health status [51]. Consequently, research has shown that not fitting the norms or having data that is not aligned with the ideal may provoke anxiety and fear [39].

Fertility is viewed and evaluated through these numbers [40]. Tracking, then, may make the process (and problems) more visible, which can be problematic when women are doing everything they can but are still not able to conceive. To some women, not conceiving despite all the effort of tracking triggers the feeling of not being 'normal' and intensifies the frustration they are already feeling. In our case, tracking without a positive result contributed to increased anxiety and stress. This is in line with prior research by Katz et al. [30], who described how seeing data that suggests a "failure" can generate stress.

Through tracking, the failures become more apparent. Because even "good" data and numbers may not lead to goal achievement, and there is no real mechanism to help identify the reasons why, thus it may become easier for those who are tracking to attribute failures to themselves. Similar to other studies [2], ours shows that data is not neutral and can have strong moral and emotional implications, especially in sensitive contexts.

6.4 Implications

In this work, we emphasized the possible negative experiences of using self-tracking for fertility. Although self-tracking may reinforce or exacerbate negative feelings, it is not our intention to argue against the use of self-tracking for fertility. It can be an important tool to improve the chances of conception and contribute to a sense of agency (as identified especially in the more positive types of engagement). However, current tracking practices may not adequately support the emotional struggles this population may face. Our findings highlight that these activities need to be carefully considered, and different actors, including health providers and developers, should be aware of these experiences. Similarly to the scenario described by Ayobi et al. [3] concerning multiple sclerosis, self-tracking can give patients the feeling of recovering their agency in the face of the disease, but it can also trigger negative feelings, reminding them of their illness. Eikey and Reddy [16] also describe similar duality of experiences in the case of eating disorders. Our study expands upon previous to highlight that, as the technology paradoxes described by Mick and Fournier [44], the same tools and activities that contribute to feelings of hope and control can also reinforce and feed feelings of anxiety, dependence, and despair. Therefore, we need to exercise caution when developing tools and suggesting self-tracking activities, particularly in emotionally-loaded contexts where cultural norms and values play a significant role.

In addition, we may be able to minimize negative engagement with data by increasing transparency. The simplification and uncertainty involved in the process of quantifying a bodily phenomenon can be made more visible in self-tracking tools. First, users need to understand that variability is part of the process, especially in fertility. Avoiding presenting the results as objective truth and providing sources of information may aid in that. Second, using data from a more diverse population when creating standard measures can improve the representativeness of the results (and avoid issues such as algorithms that do not detect non-white faces [8]). For example, the menstrual cycle length can vary, and women that have fertility issues often do not have a regular cycle. This needs to be taken into account when using a calculation that considers this measure to represent these women better. Also, showing the user different scales for different situations or different health statuses can improve the impact of self-tracking on these individuals. For example, tools could provide different interpretations or possibilities for people who recently had a miscarriage, since this heavily impacts a woman's hormonal levels.

Diversification suggestion is also valuable for accounting for emotional impact. People may need different types of support depending on the type of engagement and intensity with which they engage with data. We need to account for different contexts, personality traits, and types of engagement [30]. Similar to the scenario described by Katz et al. [30], there is a need for customization and adaptive systems. For instance, it may be beneficial to identify the type of engagement the user is experiencing at a given moment and adapt the features appropriately. In fertility, cycles of reduced or no tracking could be suggested. Katz et al. [30] suggested that

when testing self-tracking tools, we should also use data that reveals undesired states, so we can account for the impact that viewing this data will bring to the users. We extend this suggestion and argue the whole development process (e.g., product conception, requirements, user testing) should be informed by the possibility of seeing undesired data and problematic types of engagement. Adapting the suggestion of Katz et al. [30] concerning triggering acquired knowledge, we suggest self-tracking should *trigger the right type of engagement, at the right time, in the right way*. This is a design challenge that needs more attention and presents an opportunity for future work.

Finally, self-tracking practices could encourage a different attitude towards the body. Ayobi et al. [3] suggested that self-tracking should also consider mental wellbeing, instead of overly focusing on symptoms. Tracking tools should stimulate alternative viewpoints and mindful parallel thinking. Explaining alternative possibilities, making visible the issues related to the measures, showcasing the variability of the condition, not presenting pregnancy as the only possible success, and offering emotional support can trigger a different project with the body, one that may reduce negative feelings, such as frustration, stress, and depression. Considering that the body is both a symbolic site "for the reproduction of dominant values" of our current society and a site for resistance [37], adopting this different attitude with the body may be an act of transformation.

7 LIMITATIONS AND FUTURE WORK

This research presents some limitations, many of them connected to the type of data we used. First, we collected our data from an online health community, and the sample may be biased towards women that want to share their experiences online. This bias may impact the representativeness of our population, since many women may not use this type of channel, may use it without contributing, or may not have access to the health forum due to social, economic, language, and technological barriers. Further, the majority of users of the forum we analyzed are from the U.S. In sum, these users may not represent the broad spectrum of women who face fertility issues that have different social and cultural values, ethnicities, sexual orientation, or gender identity.

Second, although some studies affirm that increased stress can be detrimental to fertility [7], we make no claims concerning the association between any of the types of engagement with self-tracking and the results of fertility treatments, neither positively nor negatively. (In)Fertility is a complex topic, and this study did not focus on what can or cannot increase the success of trying to conceive. Our focus was on analyzing how self-tracking may impact women's lives when they are dealing with such a complex and emotionally-laden situation.

Since we analyzed individual posts and answers from different individuals, our data show only the experiences of tracking with each of these types of engagement, and different ways with which people relate with their own data and self-tracking activities. We did not trace back the posts of each individual. Thus, our data do not directly show the progress of the engagement (i.e., how an individual's engagement may change over time and most of the possible transitions between different types of engagement). We intend to further investigate these aspects in in our future work. We already started conducting interviews with people who faced or are facing fertility challenges to address these issues and further explore the relationship people have with their own data and how it changes through time.

Other issues we intend to address include the relation between self-tracking and the feeling of agency in fertility (e.g., to what extent it provides women a sense of control and when and how they realize this control has limitations) and other details of how the culture of self-tracking influence in this context (e.g., peer support provides the collaboration necessary for women make sense of their data [14]; however what happens if the peers are deeply involved in problematic engagements with data?).

8 CONCLUSIONS

In this study, we identified that women perform fertility self-tracking with different types of engagement. We identified five different types: positive, burdened, obsessive, trapped, and abandoning. Each of them is composed of an action and an emotional component. We suggest that this interplay characterizes the different types of engagement with data women may have when self-tracking for fertility. These findings are aligned with previous literature describing the possible negative consequences of tracking, such as feelings of failure, making a health condition more visible, frustration, and obsession. They also provide a deeper understanding of how different people engage differently with health data: ones with more positive attitudes while others have more problematic relationships with their data. Such intense and emotionally consuming experiences with self-tracking need to be considered in the design of self-tracking tools and interventions. As other health conditions may have similarly complex, unique, and uncertain manifestations (e.g., eating disorders [16]), it is possible that a similar process may occur in different health contexts. We approached how the broader issues of the culture of quantification impact on the relationship between the goal, the tracking activities, and the emotional experience of tracking in this context. Finally, we discussed possible implications derived from these findings that could help alleviate the problematic aspects we described.

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