Transitions in Personal Informatics: Investigating Self-Tracking During Moments of Change

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ABSTRACT

We present findings from a study that investigates how people engage in self-tracking as they experience a major life transition. Using pregnancy as a case study, we inquired 41 pregnant women into how their pregnancies shaped their use and engagement with self-tracking tools as they transitioned into their pregnancies. Our study highlights some of the challenges that transitions place on self-tracking, including misalignments between one's past data and current realities, and ways of realising goals. We discuss these challenges and suggest ways in which self-tracking could better account for realities which consider changing lives, bodies and identities.

CCS CONCEPTS

• **Human-centered computing**; • **Interaction design**; • **Interaction design process and methods**; • **User interface design**;

KEYWORDS

Personal informatics, Life transitions, Pregnancy

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1 INTRODUCTION

Digital devices, including wearables and mobile apps, have been increasingly used to track different aspects of human behaviour, particularly those related to health and wellbeing. Thousands of mobile apps categorised as '*Health and Fitness*' are available for free on app stores. These apps are highly downloaded, with recent surveys estimating that approximately half of U.S. adults use an app to track their physical activity, sleep, diet and nutrition [24]. These apps are also increasingly bundled with new mobile devices, making health tracking evermore present in people's daily lives. For example, *Android (Google Fit) and Apple (Health)* phones have built-in apps which automatically track people's steps, heart rate and sleep. These tools, commonly known as Personal Informatics, are used by people across several goals, such as behaviour change or self-improvement, self-learning, or simply satisfying curiosity [4].

The growing pervasiveness of self-tracking tools has led researchers to adopt a lifespan-oriented perspective for understanding how these tools are used by people [10]. We know from HCI literature that people's lifespans are "dynamic and continually developing or in flux" [7]. People enter, leave and move across different stages and events throughout their lifespans. These transitions have been shown to impact people's lives deeply and the use of technology as they readjust to new life circumstances [2, 15]. Recent literature has investigated the needs and practices of people across specific life stages and events, such as how people engage in self-tracking during childhood [13], pregnancy [26] and old age [2]. As a result, recent studies have produced detailed insights on how these tools can be designed to best support people during specific life stages.

However, often overlooked in these studies are the experiences that people have as they initially experience change and transition into new life stages and events. We adopt Svob's definition of transitions as events that cause or signal major life changes. Many researchers propose that life transitions have a distinct beginning [1, 18], characterised by moments of uncertainty and anxiety as people assimilate and admit to change in their lives. One could imagine these feelings being emphasised by self-tracking tools, as people's datasets persist and are no longer representative of people's goals, abilities or identities while experiencing change [16]. For example, while some activity tracker users might enjoy looking at and reflecting on how active they were before having children or their sleeping patterns as they start a new job; for others, past data might be confronting and out of touch with one's current goals and reality.

In this paper, we explore how self-tracking tools are used as people initially experience change in their lives. In particular, we address the following research questions: a) *How are people's motivations for using a tracking tool shaped as they experience a transition?,* and b) *How do people engage with their past data as they experience a transition?* We reflect on a case study with one unique transition: pregnancy. We use pregnancy as a lens to understand how self-tracking tools are used as people experience a life change.

2 RELATED WORK

A growing amount of research has explored how technologies are used and shaped by life transitions. For instance, previous research on retirement, pregnancy and gender transition has focused on information technologies and social media use. Figueiredo et al. [11] found that women use fertility apps in a holistic way, to follow multiple goals as they go through life transitions. Cherubini et al. [3] highlight the importance of online communities for helping

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women find and share information about their pregnancies. Similarly, Massimi et al. [19] showed how women use online pregnancy communities for emotional support, friendship and informational support in various decisions such as a home birth or going to hospital as they transition into pregnancy.

These studies have highlighted numerous changes in people's interactions with technology as the result of life transitions. Pregnant women have been found to seek increased anonymity in their interactions with online communities to avoid unwanted attention and worry from friends and family as they seek support during their transitions into pregnancy [2, 6], and seek specific, separate online spaces where they can safely explore their new identity as their needs and interests change [19]. Older adults have been found to develop new patterns of online activity that help them in the mastering of new skills and social interactions - such as using YouTube to learn how to knit [7].

In Personal Informatics literature, it is also commonly assumed that self-tracking is often subject to change. Munson et al. and Epstein et al. suggest that people change their tracking goals and practises over time [7, 9, 20], as their needs and understanding change. Some people who start tracking with the goal of changing a behaviour might switch to simply monitoring their behaviours. As further highlighted by Munson et al. [20], these changes might create misalignments between people's tracking goals and the tracking tools they use. Personal tracking tools often operationalize goals that are inconsistent with people's individual operationalizations of their goals, and even when these operationalizations are aligned, they often fail to support these goals by changing how tools are configured [20]. This can lead people to switch to a different tracking tool, better aligned with one's new needs and goals [10], or even be pushed away from tracking altogether as a result of misalignments [8, 20]. These studies focus on lapsing and abandonment of tracking, however the continued use of the personal informatics tool while going through a transition has yet to be researched.

3 STUDY

We created an online questionnaire to inquire into the use of self-tracking devices by women during their transitions into pregnancy. We chose questionnaires as we were interested in gaining perspectives from a broader, larger number of participants.

Our study focused specifically on the use of Fitbit devices, one of the most popular commercially available health and activity wearable trackers [27]. Besides tracking a number of health metrics (e.g. physical activity, sleep, heart rate), the Fitbit also supports menstrual and fertility tracking [12] and has a number of personalised interfaces for pregnancy (e.g.[18]).

The questionnaire first established people's demographic in respect to their age, stage of pregnancy and currently owned Fitbit model. People were then asked whether they had already been using a Fitbit prior to their pregnancy. Participants that had not been using Fitbit prior to their pregnancy were discarded from the study. For those who had, open-ended questions were used to understand what their tracking goals were prior to their pregnancy, and how their Fitbit helped in eliciting, tracking and achieving these goals (e.g. before your pregnancy, were you using your Fitbit to achieve any goal(s)? If so, which were your goal(s) and what were your reasons for choosing these goals?). Next, we asked people if their goals had changed in the first weeks of pregnancy. Open-ended questions were used to understand how frequently goals were changed and the reasons for goal change. Finally, we asked how often they revisited their past data, and how helpful this data was in reflecting and motivating them towards achieving their goals.

After completing our questionnaire, we distributed it via posts to Facebook groups and Reddit subreddits targeted at new mothers, or mothers-to-be. In total, we received 82 individual responses to our questionnaire. Of these, half (41 participants) were discarded due to vague or incomplete answers or for not owning a Fitbit prior to their pregnancy, leaving a total of 41 complete responses for further analysis. We discarded participants that were not using a Fitbit before their pregnancy because we wanted to understand tracking practices, needs and goals as they entered the transition into pregnancy. Therefore by focusing on participants who used a Fitbit before their transition, we were able to observe how interaction with their device changed. Of these 41, seven participants were in the first trimester of pregnancy (17%, week 1-12), eighteen in the second trimester of their pregnancy (44%, week 13-27 of pregnancy), thirteen in the third trimester (32%, week 28-40) and three had recently given birth (7%). Approximately half were 30-35 years old (19 participants, 46%). The remaining were either 24-29 (9 participants, 22%) or older than 36 (13 participants, 38%).

All participants had been using a Fitbit before their pregnancy, with a range of models being owned across participants. The most commonly owned models were the Inspire (15 participants), followed by the Charge (15 participants) and Versa (14 participants). All of these models provide users with similar health tracking features: they track similar health metrics (e.g. heart rate, sleep, physical activity), support goal setting and display similar health feedback to users [22].

After gathering the data, we organised and coded the results. Following a thematic analysis approach, we compiled similar answers into themes, connecting answers that followed similar stories and seeing differences in answers that diverged.

4 RESULTS

Prior to their pregnancies, most participants described using their Fitbit with two main goals in mind: (1) to learn something about their health (23 participants) and (2) to motivate physical activity and diet (22 participants). For the prior, tracking was an attempt to work out information and keep an eye out on one's health: "*I was looking at step count, HR, sleep*". For these participants, making sense of their data seemed more important than striving towards a specific goal. As one participant wrote, data was used *"for* [their] *clarification and for confirmation (...), to learn about the body rather than aiming for improvements"* (P6).

For the latter, tracking was mostly goal-driven. Participants used their trackers to set and track their progress towards specific, measurable goals, which were often suggested by their trackers (e.g. walking 10k steps per day). Participants also seemed to rely on their Fitbits to remind them to be active. One third of participants (14 participants) mentioned using notifications sent by their Fitbits to remind them to walk throughout their days. Here, participants

did not try to reach a particular step goal, but rather wanted to be nudged periodically to be active.

4.1 Did tracking goals change during the transition into pregnancy?

Most participants (78%, 32 participants) did not change tracking goals as they transitioned into pregnancy. Those that had been tracking to document and learn about their health described continuing to do so as they transitioned into pregnancy. However, we did notice differences in the ways goals were realised. Tracking was described as an increasingly social practice, with health data being shared with doctors, family members and other pregnant women on blogs or online communities, such as Reddit groups for pregnancy. For some, this was an attempt to seek support in making sense of one's data in their new contexts and changing body. This led participants to seek help from others when making sense of their data: "After pregnancy I mainly consult my doctor for everything (...) the Fitbit doesn't have a pregnancy setting so it's really messed up my resting heart rate and other stats so we usually go over it [data] and see if everything seems ok" (P29). For others, the goal was to use one's data to share pregnancy experiences: "I tend to share my data in social groups as a way to commiserate with others. I share rants/complaints about pregnant struggles as well as some positive/funny experiences"' (P10).

Those that had been tracking towards specific, measurable goals (e.g. walking 10k steps per day) also described keeping the same goals on their trackers as they transitioned into their pregnancies. This did not mean they were still able to reach their goals. Interestingly, approximately half of these participants (12 participants) described no longer being able to reach their goals, yet still kept these goals on their tracker. Of these, some (7 participants) had not changed their goals as they struggled to discern reasonable new health goals for their new realities: "*I'm not sure what a good alternative step goal would be during pregnancy*" (P15). For others (5 participants), the possibility of achieving a challenging goal outweighed the cons of a missed goal: "*I'd still like to be able to make the same goal so I keep it the same as motivation even though it does make me feel a bit bad when I don't get it"* (P10). Further, a number of participants kept the same goal on their tracker but no longer adopted it - or had temporarily disengaged from it. This was the case of P22, which described lapsing from her goals, yet still had a 10k step count goal on her tracker to later resume her goal: "*I still have it on (10k goal) but don't care much about it. I can get back to it when I become more active (...) in my first trimester I was sick and didn't even wear my Fitbit because I wasn't getting anywhere near 10k steps*" (P22).

Most of those that did change their goals described doing so in extreme situations (7 participants), where being physically active was no longer an option or following recommendations from a doctor: "*I was experiencing pain/discomfort trying to achieve it while walking so my doctor advised me to stop*" (P2). In some of these cases, the goal for using a tracker also changed: "*My activity level changed and I began using the food tracking function of the Fitbit app. The wearable morphed into a sleep and heart rate tracker instead of a pedometer*" (P31).

4.2 How did participants engage with past data during their transition into pregnancy?

Next, we inquired into the uses of participants' past data. Recent studies have found that people often face challenges when tracking and analysing their past data [19]. This can be emphasised as health datasets persist and are no longer representative of people's current goals, abilities or identities [15]. We asked participants how frequently they checked data from before their pregnancy, their reasons for checking this data, and how representative they felt their past data was of them.

Most of our participants seemed to enjoy looking back at their past data and comparing it to their current behaviours. Approximately 66% of participants (31 participants) described checking data from before their pregnancy several times per week or in a month. Many (25 participants) used their past data for learning and making sense of a new self that was forming, as described by P11: "*I just compare it to see any changes (...) I've watched my resting heart rate increase this pregnancy*". Frequently checking one's past data – and contrasting it with one's current data, gave users the opportunity to identify changes in their bodies. For others (5 participants), looking at one's past data was a way to look forward to better (or more active) days: "[I check my past data as] *a reminder that I will eventually be able to do more (. . .) seeing that I was active before my pregnancy gives me some hope that I can get there again*" (P35).

While the frequent checking of data could lead one to think that participants' experiences with their past data were always positive, this was not necessarily the case. Past data was also described as confrontational and out of touch with participants' new realities. Interestingly, we found this to be strongly dependent on the type of data being tracked, and more specifically, the level of control one had over this behaviour. Physical activity data, which participants had some level of control over, was often viewed as less useful, out of touch with one's reality and more confrontational. Contrastingly, heart rate data, where participants primarily observed their heart rates, with little or no control over it, was often described as interesting and associated with positive experiences: *"I track my heart rate, it* [past data] *represents me very well (...) but now I stopped working on losing weight and steps because I would be gaining weight and walking less (. . .) it is demotivating, Fitbit does not know that I am pregnant. . . this data does not represent me well at all"* (P36).

Even those that found past data useful described how their data needed to be checked frequently to avoid becoming "*overwhelming and difficult to make sense of (. . .) there's just so much going on and the data stops making sense after a while if you don't check. . . you forget why your heart rate was a bit higher or lower*".

5 DISCUSSION AND FUTURE WORKS

Our study suggests that life transitions shape the way people engage in self-tracking. During their transition into pregnancy, many women were challenged with how they made sense of their data, increasingly turning to other people to help them in this process. On one hand, this highlights the lack of support offered by trackers. People are often provided with raw data and have to make sense of their data, with little or no support from trackers. This can be particularly challenging during the beginning of a life transition, where data is tracked and interpreted under morphing and new

contexts. Personal informatics tools could better support people in sensemaking data collected in these new contexts by incorporating approaches such as self-experimentation, where users could explicitly frame and test questions about their data (as suggested in [17]).

Self-tracking technologies could also support people in quickly identifying (or labelling) the type of change they are going through (as suggested in [14]). This could be used to tailor the feedback given to people and facilitate the exchange of insights between people tracking under similar contexts. For example, the call for a pregnancy setting on their personal informatics device was strongly favoured amongst participants. Many of our participants mentioned seeking advice from other mothers on online forums such as Reddit. By identifying the change they are going through, trackers could then facilitate the exchange of information across people experiencing similar changes, or enabling other features, like supporting the re-interpretation of tracked data under a specific change.

Further possible development in these tools is to adjust the way they promote behaviour change. For someone who is going through pregnancy, that has both good and bad days, it would be beneficial for their device to understand fluctuations in their data and not push for lots of activity or challenge at times that the individual may struggle or have a low motivation level (as suggested in [28]). Devices should be built with the knowledge that these individuals need to maintain a healthy lifestyle as well as the discrepancy that they will not always be able to achieve a particular goal. This way, those going through pregnancy can still experience the benefits of the reminders to move without the negative emotional impacts of being reminded to move when they cannot do so.

We also found that transitions can challenge people in the ways they engage with their past data. While past data was used to learn about and draw contrasts to current behaviours, it was also seen as confronting and out of touch with people's new realities and abilities. This seems to highlight a multifaceted nature to data, with data representing different phases of one's life, abilities, and identities. This raises interesting questions about how personal informatics tools can support people in expressing and annotating these identities and 'selves' while tracking (as discussed in [21]).

We also found that many people kept the same tracking goals during transitions, despite no longer being able to reach them. While some seemed motivated towards the prospect of reaching a challenging goal, the negative impact of not reaching a goal is well documented in literature [25]. People might abandon their goals or tracking altogether if goals are misaligned with their abilities. In this sense, we believe it is important that trackers revisit people's goals periodically to re-evaluate their suitability and achievability (as suggested in [5, 8, 23]).

One must note a number of limitations to our study. Firstly, our insights are limited to a single life transition: pregnancy. Pregnancy can be seen as one of the most extreme transitions that people face. Given the variety of self-tracking domains and different tracking practises across these domains, future work should aim at validating and extending our insights by studying other transitions, such as puberty or a job change, to see if they have similar effects. An additional limitation of our research is that we did not ask if the participants had been through pregnancy before. If one has gone through pregnancy, they may have more know-how about their own body as well as a better understanding of how to interpret their data or what is best for them. Future research should also take into account the experience that people have regarding specific transitions.

In conclusion, we believe that studies on users' self-tracking practices during transitions can highlight important insights for how people can find value in long-term tracking. Resembling recent research in Personal Informatics, we believe it is imperative to continue studying and framing self-tracking from a perspective of changing bodies, which are constantly in flux and subject to change [23].

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