A Goal- and Context-Driven Approach in Mobile Period Tracking Applications

Richard A. Bretschneider(✉)

TOMORROW FOCUS News+ GmbH, Cologne, Germany
richard.bretschneider@netmoms.de

Abstract. Over the past few years the interest in period tracking apps increased, which represent a sub-genre of quantified self apps in women health. They are available in a variety of complexity levels ranging from simple menstruation diaries up to applications with complex fertility calculation algorithms. The goal of this paper is to propose an approach for a period tracking app with an adaptive user interface that takes the users goal and context into account. Our research focusses on the motivations to use a period tracker, the questions that users have regarding their cycle data and how a quantified self app could help in answering these questions.

Keywords: Self-tracking · Period tracking · Context · User experience · Personalization · User monitoring · Quantified self

1 Introduction

Period tracking originates from the medical field and has its roots long before the age of quantified self apps. Beginning of the early 1930 s period tracking became important for calendar based contraceptive methods called Knaus-Ogino or rhythm method [12]. These kind of methods are based on the biological facts that most menstrual cycles can be divided into fertile and infertile phases. These phases can be roughly calculated from the average cycle length, but today this approach considered to be unreliable [4]. From the late 1930 s until the early 1970 s a couple of methods have been developed that take changes in one or more of the primary fertility signs basal body temperature, cervical mucus or cervical position of women into account. Usually women who were using one of those methods documented their symptoms with pen and paper on template sheets. With the rise of mobile technology and new personal informatics tools [6] it is possible to track symptoms and moods on mobile devices. Period tracking habits more and more shift towards using apps instead of pen-and-paper [5]. For the ongoing development of the NetMoms Cycle Calendar app for iOS and Android smartphones we are continuously researching in the field of HCI to meet the requirements and overcome common pitfalls in this special genre of self-tracking apps.

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2 Research

The NetMoms UX team conducted a competitive research of app reviews, an online survey and usability tests with pre-existing period tracking apps in a lab (5 participants) to gain insights and requirements for the first implementation of our own app. Based on these insights we built our first prototypes and the first implementation of the app which has been released in June 2014.

2.1 Competitive Research of App Reviews

In order to identify common pitfalls in period tracking we analysed comments on app ratings of 13 period tracking apps. Ratings of 7 apps were analysed in the Android Play Store, the ratings of 6 apps in the Apple iTunes Store. We don't see these comments as a reliable source for definite conclusions about the quality in HCI, but they were a useful indicator to develop the hypothesis for our first usability lab studies and the online survey. Frequently mentioned problems were the following:

- List of possible symptoms / moods is too confusing
- GUI lacks clarity
- Too few gradations to enter menstruation
- No option to set a reminder for the pill
- App is missing pregnancy mode

2.2 Online Survey

As an additional indicator for common problems in period tracking we set up an online survey that has been publicised on our website netmoms.de. The goal was to get more insight in typical behaviour of women using period trackers or substitute products. 90 % of the 196 women that participated, were using Smartphones on a daily basis, 61,60 % already used at least one period tracking app within the last year. 43 % of the participants mentioned they were tracking their period with an app for more than one year, 49,60 % were using such an app for less than a year, the remaining participants didn't answer this question. 22 % stated they already switched from one period tracking app to another. An interesting insight was that more than 50 % of the reasons, which can be seen in Fig. 1 mentioned for switching the app could directly be related to HCI; In 28,6 % the reason was "Too complex" and also in 28,6 % the participants mentioned that the app was "too confusing".

55 % of the participants said that they would use period tracking apps to get pregnant, while only 10 % would use it as contraception method. 63 % stated that they would use such an app just to observe their menstrual cycle without having birth control purposes in mind.

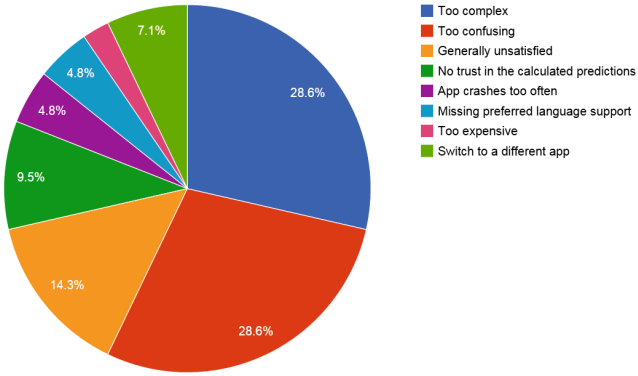

Fig. 1. Reasons to uninstall a period tracking app

2.3 Usability Tests with Pre-existing Apps

In order to gain understandings about typical problems and desires that users have when using period trackers, we tested pre-existing apps of competitors. This lab-based usability study consisted of five sessions with one user at a time. Besides the participant and the test-leader one note-taker was attending the test. Period tracking is a very personal topic, which may make the participants feel uncomfortable to talk about in a lab-situation. To reduce this effect we also strictly made sure that at least one person, either the test-leader or the note-taker was female. The session consisted of a screening questionnaire, a Concurrent Think Aloud Test (CTA) and a semi-structured retrospective interview. The CTA was recorded on audio and documented by the note-taker. One of the participants was using a period tracker on a daily basis, three were not using such an app at the moment, but used period tracker apps before and one participant never used one before. All participants were familiar in using smartphones and apps while three of the participants were iPhone users and two were using Android smartphones. For the test we used the respective device the user was familiar with. Per session one app has been tested. As the aim of the study was to gain insights about period trackers in general, but not on the usability of a certain app we decided to use different apps for the test sessions. The test itself was structured as a scripted set of tasks given to the participants. We prepared the app with a set of entries to simulate a long-term usage. The script was loosely based on a typical daily routine of a fictive woman using a period tracker in order to increase the chances to get pregnant. Summarized in short the tasks were the following:

1. Enter your basal body temperature
2. Enter that you had stomach aches and that you felt tired
3. Interpret the temperature chart of the current cycle. Based on that: Can you make a statement about your fertility?
4. Does the app tell you when your next fertile window is predicted?

As a general insight we could state that the users don't want to waste time with the process to enter data. It was mentioned to be extremely disturbing by three users, if the app was loading or synchronizing data for several seconds before it was possible to enter data. Also one app was displaying ads or alerts that stood in the way on entering data, which was mentioned to be distracting. One of the participants commented on this 'If it's early in the morning, I'm late to go out for work and this app shows me a ton of things I don't need, then this really can make me aggressive.' Three of the five participants mentioned that they would appreciate it, if the app would remind them of making specific entries. While all of the five participants interpreted the prediction of the fertile window correctly, all of them were unsure about the reason the app calculated it that way. E.g. one tester asked 'Okay, I see a flower symbol here which means I'm fertile at this day, I think. But I would have thought that, if I click on the symbol, I would get some kind of explanation.'

An interesting side-note is that three of the five participants mentioned their preference towards period trackers with an unobtrusive appearance and name. 'I don't want anybody using my phone to see that I have such an app.' one participant stated.

2.4 Critical Evaluation of the Test Methods

The outcome of the tests gave us valuable insights into common challenges and problems in mobile period tracking apps. For the special case of period tracking we determined some weaknesses of the specific methods:

Competitive Research of App Reviews. While the feedback comes directly from real life usage a typical problem regarding app store reviews is that most of the detailed feedback is negative. The majority of positive feedback is accompanied with short descriptions like 'Very good' or 'Helped me getting pregnant', but rarely detailed feedback about what exactly this user likes about the app. Another problem is that usually it's not clear in which context the app is being used (device type, knowledge about device and period tracking). Therefore the outcome of this kind of research only serves as indicator towards possible fields of problems.

Online Survey. Our survey gave us insights in the user's experiences with period tracking apps in the past. As this survey was de-contextualized from the current usage of any concrete product it was mostly helpful to learn about the users motivations and attitudes to use such apps.

Usability Tests. The CTAs conducted were an important source for behavioural data. As it is known that lab-situations can bias the participant's behaviour, [11] we encounter additional problems in the case of period tracking: At first the topic 'period tracking' may make the participants feel uncomfortable in talking about this very intimate topic. This leads to the second problem that real data of the users is too intimate and private to be used in an usability test.

3 User Goals in Period Tracking

The research we conducted led us to the conclusion that the user's motivations to track their cycle data could be classified in the two higher-level goals 'trying to conceive' and 'not trying to conceive'. While users of the first category are mainly tracking their data to find the most fertile days in their cycle (as close as possible to the ovulation), the motivations of the latter are more heterogeneous. Users not trying to conceive using this kind of apps for birth control, medical reasons (e.g. while they are under medical treatment against endometriosis) and/or to get to know their body and to learn about individual patterns of their cycle. Typical goals mentioned were the estimation of the beginning of the next menstruation or to see, if particular symptoms appear regularly in a certain phase of the cycle. The accuracy for the predictions and calculations about the fertile days and upcoming menstruation depends highly on what data the users track and how accurate and how regularly they measure this data. While tracking 'menstruation', 'basal body temperature' and 'cervical mucus' evolves from the medical origin of period trackers we now see a trend that modern period trackers are being perceived in a broader sense as 'all-purpose life tracker' instead of just a medical purpose (e.g. New York Times article written by Jenna Wortham [13]). The participants of our survey verified this observation: 83,8 % mentioned that tracking symptoms (like headache, skin problems or stomach ache) is an important feature, followed by 66,7 %, who said that tracking their mood is important. Tracking basal temperature (41 %) and cervical mucus (43,6 %) was valued as less important. While tracking all these different parameters could be seen as an all-in-one solution, current research in quantified self clearly points out the downsides of such a diversity of options: tracking too many parameters might cause tracking fatigue [3] and the users are often unclear about what tracking options count as use [9]. Users of period trackers usually are curious about how their entered data and the predicted fertility or predicted cycle beginning are related. Entering a bleeding or a temperature might have important consequences according to the fertility prediction, while entering stomach ache or any moods doesn't affect the predictions at all. So one important challenge is to make it clear and visible, if entering a certain value will lead to an update of any prediction.

4 Functionality of the NetMoms Cycle Calendar App

The core of the app is the possibility to track cycle related data for each calendar day. We implemented the following categories:

- Bleeding / Menstruation
- Basal body temperature
- Consistency of cervical mucus
- Symptoms (stomach ache, skin problems, ...)
- Influences (alcohol, timezone change,...)
- Moods (Happiness, desire to eat salty food, ...)

– Notes
– Tests (pregnancy test, ovulation test)
– Sexual intercourse

By entering a menstruation a new cycle gets started, so the first calendar day where a bleeding has been entered until the last day before the next bleeding (typically 26 - 30 days) is being interpreted as one cycle. Three methods were implemented to help the users to get insights about their fertility [8,10]: Knaus-Ogino method (rough fertility predictions based on average cycle length), temperature method (retrospective calculation of the fertile days based on daily measurements of the basal temperature) and symptothermal method (temperature method enhanced by daily measurements of the quality of the cervical mucus). The more complex the chosen method is, the more accurate predictions and evaluations can be calculated.

The app consists of four main screens: graphical chart, overview, calendar and entry menu. The graphical chart displays all temperature and cervical mucus values that have been entered for one cycle. If enough data has been entered so that the fertility of one cycle can be calculated, the fertile window is being highlighted through icons and background color in the chart. Also the charts of all cycles that have been entered in the past can be accessed on this page. The overview page aims to give the users a quick and easy insight about the current status of their cycles. On the top of the page a carousel has been placed in which it is possible to slide through different calendar days. The color coding of the different calendar days and a text below the carousel indicate if this day is predicted to be part of the fertile window or the next menstruation. As the primary action users want to reach quick and easy is to enter data, we put a plus-button at the center of the page. This button opens the main entry menu for the day currently selected in the carousel. At the bottom of the overview page there are two displays, one giving information about the current cycle day and the predicted cycle length and another counting the number of days until the next menstruation. On the calendar page it is possible to see all fertile windows and cycle beginnings (predicted and actually entered by the users) in a more global context. Also there is the option to click on a certain day to edit the respective data. Users who are using either the temperature- or symptothermal method are able to compare their fertile window that has been calculated by the method chosen and the fertile window that has been predicted at the beginning of the cycle. The main entry menu consists of nine buttons which correlate with the nine categories mentioned above. On click a popup window appears, which shows more details that can be tracked in this category (Fig. 2).

5 A proposal for a Goal- and Context-Driven Approach

The first implementation of our period tracker is a basic version, which will continuously be improved through ongoing research as described in the previous chapter. To support users in period tracking we propose a goal- and context-driven approach. Our next implementations will be gradually enhanced by the following features:

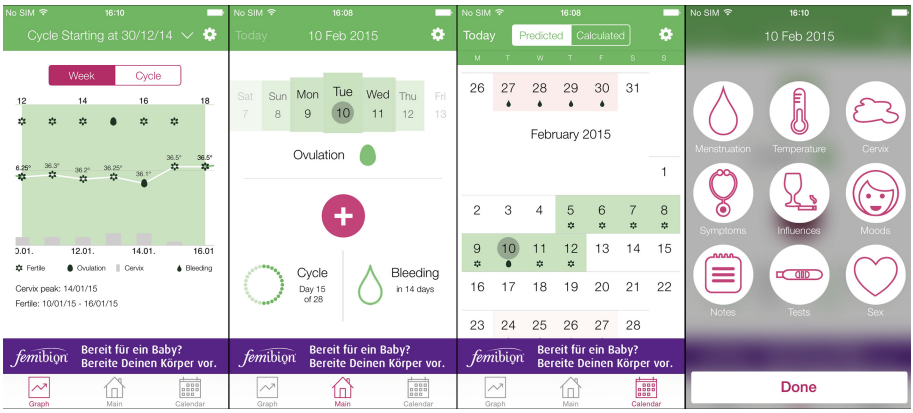

Fig. 2. Main screens: graphical chart, overview, calendar, entry menu

– In order to be able to reveal patterns and trends it is important that the tracked data can be assigned to a certain cycle phase
– Users easily can compare data of different cycles and cycle phases
– The app supports the user by taking the current cycle phase and the user's goal into account

As pointed out the user needs can be put on the three dimensions 'goal', 'preferred method' and 'current cycle phase'. In line with the results of Li et al.'s research about tracking in general [7] as well our tests showed that users have different questions about their data in different phases of their cycle in the case of period tracking. We treat the cycle phase in which a specific entry has been made, as the main context indicator in our period tracker. This is essential as the tracked data may lose it's sense when being removed from it's context [9] (Fig. 3).

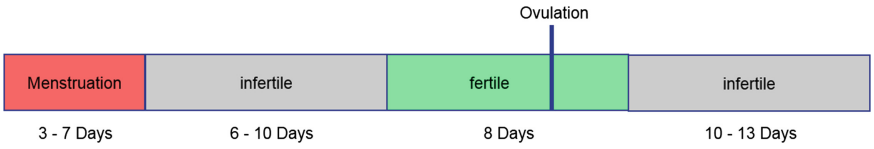

Fig. 3. Overview of the cycle phases

Especially the data the users enter during and right before their menstrual and fertile days are of high relevance to them as these cycle phases typically correlate with a higher emergence of body symptoms. The main goal of period tracking is long-term reflection as users want to compare their data of different cycles. The user's goals (in this case: trying to conceive or not trying to conceive) fundamentally influence their reflection- and action stage [7] of the

tracking process. Therefore it should affect, which information should be highlighted in the app. Also the app should be able to give intelligent hints and reminders in case the user forgets to enter enough data. The different methods to predict/calculate the fertility vary dramatically in how much effort the user needs to make. Highly engaged users need to be given more options and coherently need more supported navigation within the app. On the contrary the users who are not using a more complex method prefer a more reduced interface.

6 Outlook

The behavioural research we conducted so far was only lab-based and therefore de-contextualized from the real life usage. But as a lot of users are using their period tracking apps at least once a day we can only explore a small slice of the pitfalls and problems in this topic. We expect deeper insights from long-term ethnographic field studies, which are planned to be conducted with a set of 3 to 5 users over a time period of 6 to 12 months. This way we expect to learn more about typical problems users have in using period trackers to achieve their higher-level goals as 'trying to get pregnant' or 'get to know the body'. In other words: With long-term studies we hope to learn more about how period trackers can be enhanced and optimized in order to improve the user's life. Nonetheless we continuously invite users for CTAs to improve existing and new features. Our latest, but yet not completed studies show that especially features that help the users to examine their data and compare different cycles or cycle phases are meaningful test-cases for lab-based CTAs.

Actually the users get reminders to enter certain data like e.g. temperature. These kinds of reminders work for values like basal body temperature that can be measured at a defined time. Reminders to enter data like moods or symptoms are way more difficult to implement as the system doesn't know, if any of them occured. If the user doesn't enter moods or symptoms directly when they're occuring, it's difficult to reconstruct the perceptions as memories become more schematic or stereotypical the more time has passed [1]. As Cena et al. point out this especially is problematic in tracking emotions, if the user is not aware of the location, time and people in the surrounding when the emotions occured [2].

In general it can be said that the latest trends in period tracking are a broad area of study for the fields of HCI and quantified self. Apps that help women to learn more about their body or to get pregnant can truly be said to have a strong impact on them. Optimizing the collection and reflection of cycle data in mobile applications will definitely remain an interesting area of research.

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