Baby-Tracking Technology: The Window to Reflection

Julianne Louie*, Tara Mukund*, Chau Vu*
Advising Faculty Members: Alexandra Papoutsaki, Daniel Epstein

** Equal contribution*

1 Motivation

A gap in understanding *temporality* in personal informatics:

Researchers in personal informatics have proposed various models [1, 2] on how people use technology to collect and reflect on data, potentially leading to action. While there are differences in whether reflection occurs simultaneously or separately from data collection, the field has primarily focused on long-term reflection, requiring large amounts of collected data to reflect meaningfully. This emphasis has overlooked reflection that occurs in the short term.

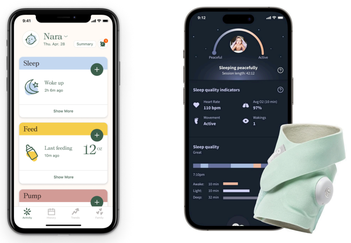

Fig 1. Examples of baby-tracking technology

Baby Tracking as a case study for examining temporality:

The birth of a baby requires parents to repeatedly perform tasks such as feeding and changing diapers, which can be challenging due to physical and emotional changes, including compromised memory, depression, and sleep disruptions for both parents. Medical associations recommend record-keeping and hospitals often provide paper logs for tracking feedings and diapers. Many parents turn to technology to automate this record-keeping process, a practice known as **baby tracking**. As in most personal informatics literature, baby tracking research has focused on long-term goals, such as developmental milestones and preserving memories for sentimentality. However, raising an infant also involves ensuring that their diverse needs are met multiple times daily, making the tracking of daily minutiae a highly common practice in baby tracking.

We chose baby tracking as a case study through which to examine temporality with an emphasis on short-term reflection.

2 Research Questions

RQ1: What are parents' motivations for tracking their different aspects of their baby's life?

RQ2: How does temporality tie into the different ways that parents reflect on their tracked data, especially in relation to supporting their short-term needs?

RQ3: How do parents' tracking interests change throughout the first year of the baby's life?

3 Methodology

- 20 semi-structured interviews (at most 1 hour long)
- Participants were parents of infants (up to 12 months old) who have been tracking their daily routines (e.g., nutrition, sleep, diapers) using technological solutions, such as apps or spreadsheets.
- Participants were asked questions related to:
  - what they tracked, who they tracked with, and how they tracked
  - what their tracking and reflection habits and behaviors were, in relation to each category they tracked since the baby's birth
- We conducted thematic analysis by open-coding the interviews based on our research questions

4 Results

To answer **RQ1** and **RQ2**, we created a model of our short to long-term reflection in Fig 2, where:

Short-term reflection is composed of the following three windows, and each of them is uniquely tied to the motivations parents have when tracking:

- ***Immediate window***: parents reflect during or immediately after tracking, often to align with medical guidelines and prior patterns or to prepare and schedule caregiving tasks.
- ***In-Between window***: parents reflect on the last entries tracked and in between two tracking activities to augment their memory and plan ahead without the need for direct communication among different caregivers.
- ***Cumulative window***: parents reflect on tracked data within a short time frame, usually in the past day, to ensure their baby meets certain totals for categories like nutrition and sleep and to prepare for the remaining or following day.

Further, long-term reflection is typically associated with identifying trends and patterns, seeking encouragement, and reminiscing.

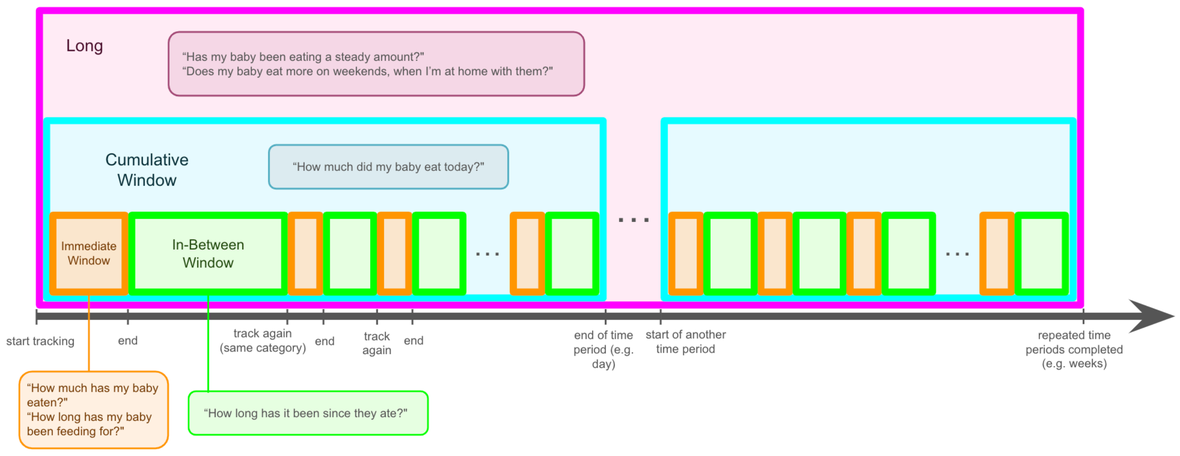

Fig 2: Temporality Model indicating the three windows of short-term reflection and long-term reflection along with typical questions asked by parents

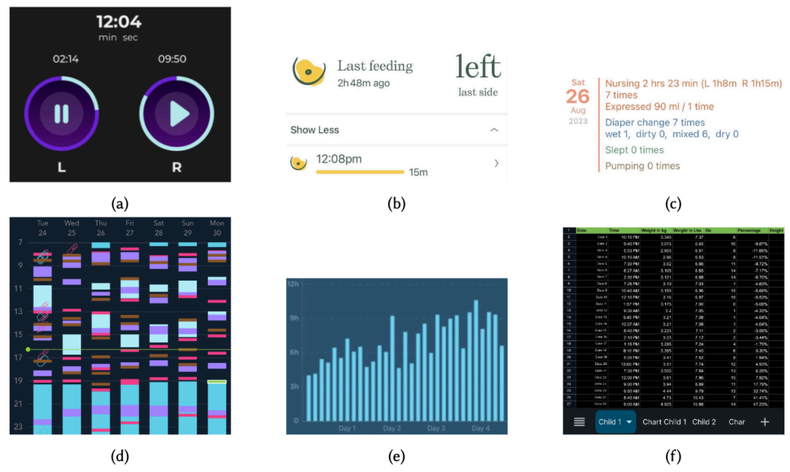

Fig 3: Examples of real use cases showing temporality in tracking

(a): *Immediate window*: Parents use the ongoing breastfeeding timer, which allows for monitoring the feeding duration on each breast (What To Expect App)
(b): *In-Between window*: Knowing how long it has been since the last feeding and which side was the last one they breastfed on can help determine when and which side to breastfeed next. (Nara Baby App)
(c): *Cumulative window*: Holistic view of what happened throughout the day, ensuring progress towards totals.
(d): *Long-term reflection*: Using multiple days' worth of data allows for the establishment of patterns (Huckleberry App)
(e): *Long-term reflection* can provide encouragement, for example, by identifying a positive trend in the amount slept over the past weeks. (SNOO App)
(f): Parents devised custom tracking solutions, like spreadsheets, that could serve multiple types of reflection (Google Sheets)

To answer **RQ3**, we found that typical changes in tracking interest occur at the end of the newborn phase, when consistent patterns emerge in the data, upon parental return to work, and when concerns about the baby's well-being arise.

5 Conclusion

1. We expanded the definition of short-term reflection to have three windows: Immediate, In-Between, Cumulative
2. Although literature primarily studies long-term reflection, short-term reflection is prevalent in baby tracking and can be applied in other tracking domains (exercise tracking, diet management, chronic illness management, etc.)
3. Interest in tracking often changes after the newborn phase, when there are consistent patterns in tracked data, and after the parents return to work.

Key related literature

[1] Ian Li, Anind Dey, and Jodi Forlizzi. 2010. A stage-based model of personal informatics systems. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '10). Association for Computing Machinery, New York, NY, USA, 557–566.
[2] Daniel A. Epstein, An Ping, James Fogarty, and Sean A. Munson. 2015. A lived informatics model of personal informatics. In Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp '15). Association for Computing Machinery, New York, NY, USA, 731–742.