

Fertile Becoming: Reproductive Temporalities with/in Tracking Technologies

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ABSTRACT

Through close analysis of fertility and menstrual cycle tracking apps, this contribution explores how reproductive bodies, and their temporalities are understood, made and reshaped with and through technologies. We rethink reproductive temporalities through the lens of Kafer's (2013) and Forlano's (2017) notion of queer/crip time to account for the different and individual temporalities of bodies. By tuning into the everyday rituals and temporalities that emerge when living with real-time data around sociocultural norms of reproduction (Forlano, 2017), we make visible how fertile bodies are in a constant state of becoming. Empirically, we home in on the processes of becoming or unbecoming fertile and engagements of self-tracking as well as practices of self-care by drawing on data inquired through digital ethnographic methods. To contextualize the analysis within broader, (sub-)cultural imaginaries of reproductive futures, we combine walkthroughs of apps (Light et al., 2018) with analysis of discussions and data-sharing practices on social network sites dedicated to fertility tracking and queer/non-binary experiences of reproduction.

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INTRODUCTION

If only we had known earlier...

This was a common phrase we encountered during our research on reproductive technologies and how they enable sense-making about fertility and reproductive potentials through data.

If only we had known earlier, we would have started earlier. *If only we had known earlier, we would have frozen sperm (or eggs). If only we had known earlier, our future would look different as we could have acted accordingly.* These recurrent ‘if only’ narratives are just one example of how people who are concerned with infertility negotiate their present in relation to the past. They reveal what Barad (2010) refers to as lingering thoughts of the past and possible futures of what might yet be/have been.

In this chapter, we explore the multiple entangled temporalities of navigating fertility that we encountered in our research on menstruation and fertility tracking applications (MFTAs) and how their users share and make sense of intimate bodily data tracked by these devices. In examining such apps and how people discuss their use in online forums, we observed many complex temporal relations such as rethinking and reencountering the past, managing expectations related to diagnosis and predictions in the present, and desires for the future. We are interested in understanding how such temporalities become structured through everyday engagements with technologies. We particularly investigate MFTAs and how they shape rhythms and relations to time and bodies. This includes how they embed particular biopolitical structures of reproduction through the ways they visually and narratively represent time, such as menstrual cycles, to the user; how they orient the user temporally in relation to their lived bodily experience of fertility and reproduction over time; and also, how users negotiate time through collective sense-making regarding data about their bodies within an ecology of apps and technologies aimed to assist with reproduction.

MFTAs make up a large part of the FemTech market with currently around 300 apps (both iOS and Android) available and the number is continuously increasing. Such apps prompt users to track their bodily sensations, activities, and practices. Through rendering this information into quantifiable data (Lupton 2015a), they provide predictions on future beginnings of menstrual bleeding and fertile phrases.

We scrutinize which particular temporalities are embedded into current MFTAs through how they represent, organize, and narrate time for the user. For example, they tend to capture data related to the present ‘where am I in this cycle?’ and display data related to the future—‘when am I ovulating?’. We argue that the temporality of reproduction in these apps is reduced to linear, progressive narratives, as we will show through concrete examples. Overall, bodily experiences of the present (e.g. menstrual bleeding and ovulation) become translated into data archives of the past that serve as basis for action in the present (e.g. intercourse) to produce an anticipated future (becoming pregnant).

We ask how people navigate within the limitations and normativities of these apps, to understand how the complexity of reproductive temporalities often exceeds what these apps can represent. We find that people make sense of their data and the linear as well as progressive notions of time with others through in-app or online forums. We therefore

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examine extended discussions around reproductive self-tracking data in online forums where people share their tracking data and experiences with MFTAs more broadly or create alternative practices of data sharing. We analyze discussions of people encountering these apps from intersecting, and non-fixed relations to health, for example from infertile, queer, or non-binary positions. Such narratives reveal how reproductive temporalities are not only experienced in the present but also over the long durée and via retrospection.

Thus, this chapter offers an entry point into understanding the role MFTAs play in the narration of reproductive temporalities. At this point we briefly want to clarify our understanding of *reproductive time* and *temporality*. Reproductive time attends to moments where reproduction is biologically possible, i.e. ovulation and fertile years. Whereas temporality encompasses phenomenological modes focused on lived experiences of time (Freeman, 2010). In other words, with temporalities we refer to the lived and embodied experiences of reproductive time and the entanglements of past and future that form actions in the present. Temporality further entails social constructions of reproductive time, for example, through narratives of good time in one's life to become a parent. Thus, temporality, as opposed to time, is defined by multiplicity, entanglements, and relations.

To understand how temporalities are embedded in MFTAs and to map the interactions such self-tracking applications afford, we analyze data obtained from the walkthrough method (Light et al., 2018) and autoethnographic engagements with the MFTAs Drip, Clue, and Tilly¹. The walkthrough method was employed to attentively and meticulously walk through an app's interface to unpack the social and cultural understandings of reproduction and reproductive bodies embedded in those. A1 expanded the 2nd phase (everyday use) of the walkthrough method with a longer autoethnographic engagement over a period of six months. Here, the author engaged daily with the tracking prompts of the three different MFTAs, taking screenshots, and writing down reflection notes when deemed necessary (see also Reime et al., 2023). To understand how people navigate reproductive temporalities and complexities, we also built on data conducted through digital ethnography in three online spaces on Reddit where infertility is being discussed². Through these multiple data sources, we explore how

¹ Clue is one of the most used apps on the market for fertility and menstruation tracking, with a total of 12 million active users. Clue therefore builds part of the 'status quo' that some newer apps, like Drip, are positioning themselves against. Clue allows users to track bodily symptoms (e.g., bleeding, pain), activities (e.g., intercourse, exercise), emotions, as well as means of birth control (pills, IUD). The data is then analyzed and visualized by the app to predict future fertile windows and menstrual bleeding. Drip is a rather new app (first available for download since 2022), open source, and embodies ideals of inviting users to be in control of their data. Additionally, it is developed by women, and its creators communicate explicitly that this app departs from current MFTAs, by having addressed and improved particular aspects, such as transparency, data privacy, and bodily sensemaking. In Drip, users are actively encouraged to explore their bodies through touch, as the consistency of the cervical mucus is one of the markers Drip uses to make fertility predictions. Tilly is specifically targeted on tracking when in fertility treatment, which adds a different dimension and medicalization to menstruation and fertility tracking. Apart from tracking bodily sensations (e.g., cramps, bleeding, temperature), emotions (e.g., happy, calm), and activities (e.g., intercourse, exercise), Tilly also offers the possibility to track one's fertility protocol and medication. Tilly is conceptually developed by two women who have gone through fertility treatment themselves—a 'stressful journey' that they now want to support others with through data-driven personalization (see also Reime et al. 2023).

² We understand these as vulnerable spaces, despite their online availability. We have used quotes that are paraphrased in a way that they should not be traced easily. To further ensure anonymity, we refrain from naming the exact subreddits we are investigating. We are exploring three different forums which are freely accessible on Reddit,

time and temporalities are being understood and narrated in MFTAs and how these understandings bring reproductive bodies into being³. Not only do lived experiences of reproductive temporality exceed these reductive temporalities presented by MFTAs, but the apps and their temporal frames are now part of the entangled experience of reproductive health.

MFTAs, while focused only on data collection and prediction, reshape and reconfigure experiences of reproduction. In that, they join other reproductive technologies, such as ultrasound or in vitro fertilization, taken up in prior critical Feminist STS work (e.g. Franklin, 2022) and are also entering the space of the socio-material making of reproduction. Recent technological advancement within reproductive health promises ‘pregnancy for everyone’ as the ‘broken reproductive body’ can (partly) be fixed through processes of assisted reproduction or IVF (Welsh, 2019). Prior ‘infertile’ bodies (either medically or socially) now have the possibility to become fertile and pregnant (Mamo, 2007 ; Welsh, 2019). Within this technoscientific development (some), queer bodies become fertility patients, not (or not only) because of their physical conditions but because of their sexuality (Mamo, 2007). Consequently, such technologies are entangled into broader cultural structures, carrying the potential to challenge heteronormative ideas of parenthood and family, while at the same time running the risk of reproducing such structures by reinforcing normativities of reproduction (ibid). These technologies are also part of complex temporal narratives of reproduction, as they (potentially) extend reproductive time by prolonging ‘biological clocks’ (Bach, 2022; Kroløkke, 2021 ; Wahlberg & Gammeltoft, 2017). Through egg or sperm freezing at a young age, reproductive futures are being secured, to realize one’s reproductive potential, once the ‘timing’ is right, independent from bodily temporalities. Reproductive temporalities are thereby disconnected from bodily temporalities of aging and decreasing reproductive potential.

However, not only assisted reproduction and IVF are redefining reproductive time and temporalities; MFTAs are also suggesting timelines to act upon reproductive potentials through rendering intimate data archives into objective data outputs in forms of notifications and representations of ‘fertile windows’. MFTAs, through such suggestive timings, shape what is ‘good timing’ for reproduction both at a moment in a particular cycle as well as throughout one’s life course. They shape experiences of time through the habits of logging and calculation and people managing their expectations of such calculations. All in all, these apps and the data

whereas one is addressing fertility more broadly, the second one is specifically geared towards aspects of queer reproduction, and the third one is used for picture sharing and comparison of fertility-related tests.

³ To situate our work and the ways we have surfaced the following analytical contributions, we find it important to spend some words on our own positionality. Each of us identifies as a woman, who, to different degrees, have been engaged with our own menstruating bodies and their fertile potential. One author has navigated infertility and participated as a subject of medical research on infertility as well as participating in data sharing among LGBTQ* groups related to fertility, while the other two authors previously tried to make sense of their fertile potential in order to avoid pregnancy. Therefore, our lived experiences in this regard are varied.

collecting and sharing they enable become tied up in processes of becoming (in)fertile, we argue.

In what follows, we first situate our work within existing research and theories on reproductive temporalities and self-tracking. We further hone into the processes of becoming fertile through and with technologies, particularly MFTAs. We attend to the temporal norms that are reinforced through MFTAs and how they become part of reproductive sense-making ecologies. Our research shows that people experience fertility through a complex entanglement of data tracking and sharing where MFTAs and their modes of embedding time are taken up by users to critically engage with their possibilities and limitations by employing an array of fertility sense-making practices.

REPRODUCTIVE TEMPORALITIES

Theoretically, we anchor this chapter in feminist, crip, and queer theories of time and temporality. Donna Haraway's (2016) work, for instance, offers us vocabulary to talk about different temporalities as *ongoing pasts*, *thick presents*, and *still possible futures* pointing to the mutual entanglement of different temporal frames. In her words, 'there is nothing in times of beginnings that insists on wiping out what has come before, or, indeed, wiping out what comes after. *Kainos* ["new" in the Greek] can be full of inheritances, of remembering, and full of comings, of nurturing what might still be' (Haraway, 2016, p. 2). With ongoing pasts, Haraway refers to how our own pasts, but also worldly pasts, are still shaping our presents and the futures we can have. Thick presents capture the multiplicity of experiences of the present, which are always shaped by the past and the future. Still possible futures are nurturing what might still be, imagining futures not only for us but the world that comes after us and how that affects our being in the present.

This entanglement of temporal frames becomes crucial in understanding how reproductive time is being made, understood, and imagined, as we will point to throughout our analysis. In that, time is not only linear and forward oriented but always also entangled in the past: 'in our now lays the future [...] we're always coming into ourselves entangled in the past' (Gammeltoft, 2013). In her research of pregnancy in Vietnam, Gammeltoft (2013) highlights how past experiences of war and chemical pollution impact present approaches and concerns to reproduction. Here, pregnant bodies carry past traumas that might affect the future of their unborn child. Recent work also shows how not only a pregnant future is being negotiated but also how the future of the child is being imagined and how that becomes impacted by current issues of, i.e. climate change (see e.g. Lautrup, 2022). Further research argues that a pregnant person is already understood as 'a mother embarked on a life trajectory of mothering' (Browne, 2022), thereby not only entailing gendered ideas of pregnancy and parenthood but also pointing towards a 'future temporal horizon with pregnancy framed as a one-way passage to birth (when are you due?) and a forward time of teleological progress and being-toward' (Browne, 2022). Reproductive time becomes the means towards this future horizon of becoming a parent.

We further draw on the concept of *crip time* (Kafer, 2013) which allows us to view (reproductive) time as individual and multiple. In 'Feminist, Queer, Crip', Alison Kafer (2013)

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brings forward understandings of crip bodily temporalities as always already out of rhythm. Kafer (ibid.) argues that socially, time is seen as productive, and bodies that cannot reach a certain threshold of productivity are seen out of sync or, rather, experience their lived experience of time as out of sync with the world around them. In a similar vein, Freeman's (2010) notion of *chrononormativity* makes sense of the relationships between norms and time and builds on the 'use of time to organize individual human bodies towards maximum productivity'.

More specifically, Luciano's (2007) notion of *chronobiopolitics* tries to make sense of how lifespans become organized through 'teleological schemes [...] such as marriage, accumulation of health and wealth for the future, reproduction, childrearing, and death and its attendant rituals' (Luciano, 2007 in Freeman, 2010, p. 4). In other words, chronobiopolitics moves beyond individual temporalities towards understanding how entire populations are managed through such schemes, synchronizing and relating bodies not only with each other but bigger temporal and social schemes, and rituals. For example, Martin's (2001) work shows how ideas of reproductive time, i.e. when a body is able to reproduce, is deeply entangled in gendered and social narratives of reproduction. Her work also highlights how narratives of reproduction are closely tied to ideas of citizenship and how such narratives cast the female body as a machine-like reproductive body 'producing' children (ibid). Thus, reproductive 'efficiency' takes on new meaning when it now becomes entangled in everyday practices of datafying reproductive bodies. In such teleological schemes, some bodies are always already outside of these normative temporalities through their positions in the world. This helps us to understand how MFTAs are remaking or reproducing such schemas and how the feeling body becomes an alternate collection of time (Luciano, 2007).

We draw on these theories of time and reproductive temporalities to frame questions for our analysis such as: How do people navigate their temporal schemes and make sense of them in relation to lived bodily experiences? How are crip and queer temporalities of being out of sync mediated by these apps? What are the 'thick' presents of becoming fertile? This allows us to surface moments where temporalities become visible, structured, and entangled, as well as to bring forward understandings of reproductive time which exceed biological terms, but rather asks how people make sense of their own reproductive time and temporality in becoming fertile.

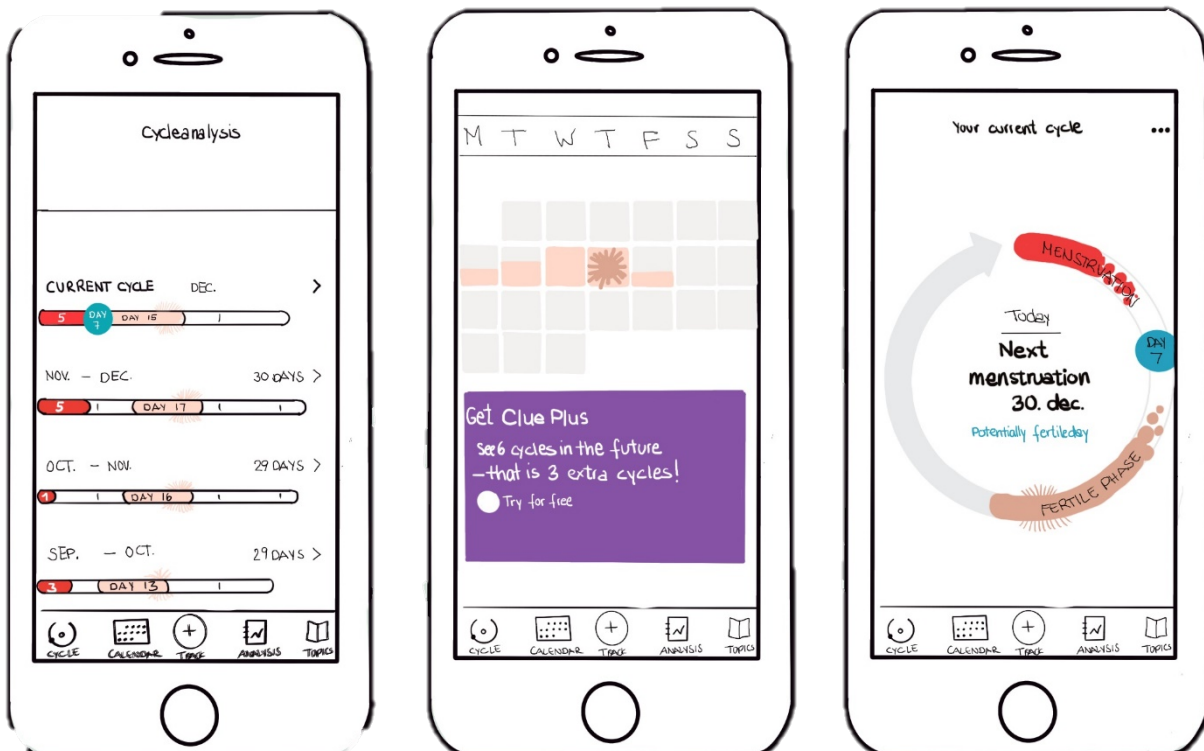
Before moving into the analysis, we want to briefly situate practices of self-tracking within current research on MFTAs. Work in this field suggests that these apps are mainly designed for fertile, reproductive—willing and—able cis women in heterosexual relationships (Epstein et al., 2017; Lupton, 2015a), thereby neglecting the reality that not all women and not only women menstruate and excluding those who do not equate menstruating with being female (Homewood, 2018). Thus, critical and feminist scholarship argues that such technologies reproduce what it means to be sexed and gendered, as they are a product of entanglements with social structures, practices, and norms around reproduction (Cifor & Garcia, 2019; Homewood, 2018; Roberts et al., 2019). Other critiques from contemporary feminist research show how most reproductive health technologies still equate women's health with reproductive health, neglecting intersectional standpoints of women and gender as non-fixed categories (Keyes et al., 2020). Further critique attends to how those systems create issues of surveillance and data sovereignty (Mehrnezhad & Almeida, 2021). But research also points to

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their empowering potential of creating more self-knowledge and awareness (Andelsman, 2023; Homewood et al., 2020). For example, Hamper's (2020, 2022) work shows how women in the UK use MFTAs to make sense of their fertile window by learning about their bodies through tracking data. Further, Lupton's work (2015a, 2015b) offers a broad research scope on various socially entangled practices of self-tracking, bodies, and data. Specifically, her work on reproductive self-tracking points to the reconfigurations of bodies, as data is not only extracted from bodies but also shapes these bodies in return (Lupton, 2019). We build on this work by offering a critical engagement with normative temporal frames reinforced through engagements with MFTAs and an analysis of how reproductive bodies navigate these spaces.

MAKING AND UNDERSTANDING TEMPORALITIES WITHIN MFTAS

The following analysis exemplifies different entangled modes of making and understanding time within reproductive sense-making. We move from analytical points of how we see temporality imagined within tracking applications towards practices through which these temporalities are being made-sense-of through community practices. We present the first examples through data conducted from the walkthrough method and autoethnographic engagements, while the latter point is exemplified by community chats in reddit forums. We begin by presenting findings specifically on temporalities within MFTAs. Here, we surface how time is being represented and configured through such apps. Further, we look into which temporalities users become oriented towards, how datafied relations are built in the present towards the past and future, and how such apps are embedded in broader social schemas (chronobiopolitics) of reproduction.



Figures 1-3

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The apps represent the reproductive journey as temporal linear and cyclical. For example, Clue uses three different representations of cyclic time. The visualization in ‘Cycle history’ (Fig. 1) views cycles in comparison, it individualizes each cycle—they have a distinct start and end. The calendar overview (Fig. 2) puts the reproductive cycle in connection with time around it (meaning days and dates). Figure 3 is probably the most used visualization for reproductive time, starting with the first day of menstruation, prediction of the fertile phase and locating one’s current position on this cyclic trajectory that ends with the first day of and at the same time starts all over again. The idea of cyclic time stabilizes forward movement, promises renewal rather than rapture (Freeman, 2010). What all visualizations have in common is that they highlight and center fertile time (ovulation).

Apart from different modes of visualizing and representing time, they also afford the building of datafied relations to pasts and possible futures. Through fertility tracking in the present, data is being created that builds a ‘digital archive of the body’, which is then being used to calculate and predict fertile times. Thereby, MFTAs engage with different temporalities of the reproductive body (tracking data in the present to build an archive [past] that can predict future ovulations). ‘The future’ becomes the commodity of the app. The user shares their present and their past and the app predicts the future in return. In Clue, for example, the non-premium user only gets 3 months of prediction, whereas a longer prediction horizon of 6 months is available for users paying a monthly fee. If one has a ‘regular’ cycle, the difference between knowing 3 or 6 months in advance seems minor, as one could easily do the calculations oneself. Where it might be more meaningful for people with irregular cycles to make sense of their future reproductive times, as it might be harder to predict oneself, the apps fail to do these predictions, as they can only calculate with regularity. Thereby these apps are geared towards an ableist understanding of bodies and their regularity which makes them predictable.

Not only is the future being withheld from the non-premium user, so too is the analysis of their past. For example, Clue has A1’s tracking data since January 2019 (more than 3 years of, more or less, consistent tracking data), but because A1 has not created an account, Clue does not give her any analysis on her past cycle data, other than providing the dates. This creates an imbalance, where the user loses their data sovereignty (Prainsack, 2019). The app now has more insights on the user than the user themselves and is not sharing these insights with the user. By reading through the privacy statement of Clue and Tilly, we learn that both apps potentially share anonymized data with researchers for the purpose to ‘create more knowledge around reproduction to help people with fertility issues’ (Clue, 2022; Tilly, 2022). This help, however, does not directly reach the user, as they are not aware of the analysis that is being done about them based on their data. Creating a meaningful archive is also only possible by tracking consistently, which most people either do not do or where the apps do not allow for tracking, as they are only geared towards a certain life situation (getting pregnant/avoiding to) but do not encompass a more holistic view of reproductive life (Kumar et al., 2020), thus not allowing for consistent tracking throughout the life course. The user becomes part of an unknown future, a future where infertility supposedly can be better understood.

MFTAs orient⁴ the user towards different temporalities such as rhythms, rituals, and durations, in multiple ways. Through notifications, the researched MFTAs structure daily engagements by sending reminders to track data, measure temperature, and even give suggestions for good timing of intercourse based on the data inputs. For example, ‘mornings’ become such a temporal orientation, as this is the moment where temperature measurements should take place. Though mornings should be understood as the time when bodies are waking up, not necessarily the temporal frame of morning (i.e. sunrise to noon). Through framings of ‘mornings’ rather than for example wake-up time, some bodies are already out of sync, as different work- and lifestyles allow for different moments of ‘mornings’.

The researched MFTAs do not only structure users' time and engagement but also prompt them to ‘make time’ for taking self-care actions. For instance, Tilly has dedicated a whole section on self-care, including guides for meditation and yoga, as well as online courses regarding mental health, such as a 6-weeks course on dealing with miscarriage. While this might be helpful for some, it also assumes that users have time and can make time for taking care of themselves through meditation and have the capacity to become experts of their own body by taking the courses they offer and engaging in tracking practices as well as community exchanges. Thus, tracking technologies ‘bind’ us (Freeman, 2010) into specifically patterned lives, intimately linked to national narratives and timelines of reproduction (when is the right time and space to reproduce). That is to say, MFTAs do not only build on normative temporalities in the sense of cyclic temporalities (e.g. how long is a cycle, which day ovulation happens) but also on social temporalities of when it is socially acceptable to become pregnant. This becomes visible as the researched MFTAs are mainly addressing heterosexual couples in their late 20's early 30's. In the community space of Tilly, for example, most stories from people that are trying to conceive are from people in heterosexual relationships in their 30's. For example, one story recalls the experience of how a couple started to try to conceive when they were in their early 30's. After a few ‘natural’ tries, they took a consultation with a doctor who diagnosed the woman with fertility issues. She started treatment and eventually gave up trying, as she was getting too old. Throughout her narrative, we see the spell of the past lingering: ‘if only I had known earlier, I might have had a chance’.

The past does not only become important on an individual level. As a campaign from the Copenhagen Municipality shows, potentially reproductive bodies are geared to take action in the present to ensure their ability to have children in the future (Copenhagen Municipality, 2015). This campaign illustrates that, in contemporary western societies, people tend to have children at a later age, thus acknowledging, if not enforcing, a temporal shift in the chronobiopolitics of reproduction. Reproduction at a later age might lead to issues as suggested by the campaign: ‘your chance at becoming a mother is double as high when you are 25 than 35’, or ‘40% have a low sperm quality. It can take time to become a father’. Such

⁴ To ask about orientation is to consider how we arrive to the app as a designed object, what kind of attending to it requires of us and our body, and how it directs us along the ‘well trodden paths’. ‘Lines are both created by being followed and are followed by being created. The lines that direct us, as lines of thought as well as lines of motion, are in this way performative: they depend upon the repetition of norms and conventions, of routes and paths taken, but they are also created as an effect of this repetition’ (Ahmed, 2006, p. 16). This allows us to ask about what an app ‘affords’ in terms of how it orients the user to particular temporal experiences such as the menstrual cycle.

narratives not only reinforce gendered reproductive bodies but also fertile bodies; in other words, a younger body is more fertile than an older one. To battle a dwindling birthing rate, this Danish campaign suggests, for example, egg-freezing at a young age in order to ensure a reproductive future. Despite this campaign being critiqued for their involvement in citizens' reproduction, it thus points to entangled temporal relations. Rather than time being linear, it is nurturing of a future of what might still be, remembering a past where chances have been missed and ongoing presents infused with multiple temporalities and materialities (Haraway, 2016).

COLLECTIVE PRACTICES OF BECOMING FERTILE

So far, we have shown, through data collected via the walkthrough method, the ways that MFTAs embed and represent temporality and temporal norms, not accounting for complex and individual temporalities. We now shift to these complexities of lived experiences of reproductive temporalities. In this section, we focus on the ways people make sense of these multiple and assembled temporalities in MFTAs in relation to their own experiences. We explore online forums, as we see these spaces as sites where people come to fill gaps encountered through the mismatch of lived experiences and engagement with the apps and reproductive health more generally. Here is also where alternative ways to share tracked data together beyond what the apps can offer are being developed and engaged with. Thus, these spaces also exemplify practices of knowledge and data exchange with others in similar situations. We are interested in understanding how people navigate these apps when they do not conform to their lived experiences. We look particularly at forums where people discuss queer experiences with fertility and experiences with infertility (these are also intersecting as we will discuss). We focus on how these forums are used to share experiences with the apps or reflect together on data tracking collection and analysis.

Generally, these online forums are spaces where information is being shared to make sense of one's own body and data. People share data regarding their reproductive experiences to varying degrees. Some have details such as diagnosis, age, gender, relationship status, miscarriages, and more in their 'flair' (a little information box behind their usernames, e.g. username1 [38F | Unexplained | Single | 1MC]). Some users actively seek help by posing questions while others provide help through sharing their own experiences or opinions, while another set of users might find it helpful to read discussions without actively engaging in them. Questions users ask relate to sharing frustrations and other emotions, but also to making sense of symptoms, cyclic stages, IVF treatment processes, pregnancy tests, or of doctors' advice. Users frequently share their diagnosis and the treatment doctors suggested, apparently trying to verify with the community if this is the 'correct' process. In that, time becomes an important normative horizon that can be oriented towards (e.g. duration of treatment). Within community chats for people in treatment, normativities are a source for hope in that people tend to relate their own experience to someone else in the same situation. This becomes visible as people often answer with phrases like 'when I was at this stage', 'it looked the same for me', or 'I had the same diagnosis and treatment, and this happened to me'.

Normativities of time are being used to make sense of one's situation. Where should I be at this stage of my pregnancy or at this stage of my IVF treatment? What did others do? How many tries did others have? What is normal?

These conversations could already be understood as data-sharing practices, where users share intimate information about their treatment, relationships, and diagnosis. But we also encounter examples where data sharing is approached in a more organized manner through, for instance, a spreadsheet. Whereas the forum entries are tied to experiences, emotions, and worries, the spreadsheet offers a collection of 'purer' data. Here, users can enter information including their reddit username, infertility diagnosis, age (at egg retrieval), cycle date, treatment protocol, the number of eggs retrieved, medication taken, whether sperm or egg donor were used, the costs, and much more.

Contrary to earlier examples, where MFTAs built data archives of users' data and share them with researcher beyond their control, this example can be understood as a bottom-up practice of creating a database that is accessible for everyone—a crowd-sourced resource from the community to the community people are engaged in. Such data sheets also fill another role, namely making sense of one's body in relation to others. The spreadsheet can be filtered in/excluding certain diagnosis or treatments. Consequently, users can find other users with similar parameters such as age, diagnosis, treatment, and from this information make assumptions about their own body, such as the amount of IVF procedures they will most likely need. What becomes visible when looking at the forum and the spreadsheet is that most users are in heterosexual relationships, and thus focus primarily on the female body for tracking and intervention. In that, social infertility is not specifically included though also not excluded, as the forum guidelines make clear that everyone concerned with infertility is welcome in the forum. However, there are different temporalities and relations at stake, depending on medical or social infertility (or an intersection of both), as we elaborate further.

TEMPORAL AND BODILY PLURALITIES

Medically, heterosexual couples are understood as infertile after one year of trying (having unprotected sex during the ovulation period), unless any affecting illness is known prior to that. Queer temporalities differ, as there is never a 'trying' period. From the beginning, queer bodies are entangled in multiple structures such as medical examinations, law, technology, hormones, and data. During this process, not only identities as parents become negotiated but also gender identities are being negotiated, gained, and lost. For example, Dahl's (2018) work illustrates how gay identities are being reshaped through pregnancy and parenthood, but also through national, in this case Swedish, narratives of reproduction. Focused on reproductive technologies and queer bodies, Mamo (2007) shows how wombs that have been previously outside of reproductive time are through technological and legal advancement embraced into this space: 'Becoming fertile, a process that involves a desire to reproduce through pregnancy, is a rather queer phenomenon; it is profoundly shaped by effects of and access to medicine itself' (van Balen & Inhorn, 2002).

In the forums, we see people discussing their plans of becoming fertile in advance before even starting any treatment. For example, one user started planning treatment four years in

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advance, as processes such as sperm donor quarantine result in a longer temporal frame for conception. In response to this thread, most users share that they planned at least one year before they started trying to conceive. This includes finding a doctor, finding a donor, maybe even doing transitions, reducing/increasing hormones before the ‘actual’ trying can start. ‘Queer Conception: The Complete Fertility Guide for Queer & Trans Parents-to-be’ (Kali, 2022) is a book most frequently discussed and shared as an invaluable source for starting the journey. Here the ‘pre-starting process’, which includes making decisions and creating a timeline is the first chapter. This indicates how important planning is being understood and how the present is being planned towards the future. Knowing the exact time of ovulation becomes even more relevant in this process as not only the desire to get pregnant is involved but also different stakeholders (doctors, donors) and infrastructures, as well as financial resources (depending on location), and extended emotional labor.

Once a body has entered AR or IVF, their temporalities become more vulnerable due to repeated delays and disruptions. Users share their concerns with missing the ‘perfect cycle’ due to sickness or doctor office opening hours. ‘What would have been if we would have been able to use this cycle?’—is a question we frequently encounter in the forums. The stories of several users show, for example, how they are affected by the COVID-19 pandemic, not only in terms of closing/opening hours of doctor offices but—in the longer perspective—shortages on sperm donations and resulting waiting lists. Answers to these posts are trying to see the positive, that they now have one more month of tracked data, which will make it easier for them in the future to determine ‘good timing’. Other advice suggests zooming in and out of life, thinking about the decades of life staging. Instead of being upset about this moment, zooming out to realize that there is a whole ‘family making decade’ (20-40), so one month will not affect this. Another suggestion is to group cycles in 3-months blocks, which should help to minimize the disappointment of one failed cycle, making each cycle in itself less vulnerable.

Significantly, none of this can be represented in how MFTAs are currently designed. There is no possibility to think of/group cycles differently, as the apps offer a cycle-to-cycle thinking and set of representations. There is no such representation of a ‘pre’ phase, though apps might be mainly useful in the ‘pre’ phase, where users are learning about their bodies, and ‘becoming fertile’ in order to be ‘ready’ once they actually start trying. Moreover, the MFTAs we explored do not allow for adding insemination—only intercourse. Even though Tilly is an app developed for people concerned with infertility, the treatment categories only include treatment start date, egg retrieval, embryo transfer, follicle check, pregnancy test, ovulation injection, start of stimulation, appointment but not specifically insemination. This potentially indicates that most MFTAs are specifically designed for a certain part of the reproductive process. In this case, the ‘becoming fertile’ phase, adding medication and treatments, but once insemination happened it seems to transgress into a ‘pregnant’ body who cannot be tracked through this app anymore.

ECOLOGIES OF BECOMING FERTILE

Through research into MFTAs and online communities, we explored how temporalities of reproductive bodies are represented, configured, and navigated. We pointed towards complex

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temporalities of (in)fertile becoming. We now shift towards discussing the ecologies of reproductive bodies and how they come to matter through MFTAs and social narratives of reproduction.

MFTAs and other means of digital tracking have a linear understanding of reproductive time in the sense that they cannot deal with disruption of the linear forward movement towards pregnancy which ultimately results in the birth of a child. Thereby, MFTAs cater towards an ableist view of reproductive bodies. That is, through sufficient self-knowledge and observation, bodies can be moved, or progressed, into fertility. Reproductive time becomes the means towards this future horizon of becoming a parent, anticipating the right moment to establish this horizon by tracking and making sense of data. Miscarriages, abortions, and illness, however, destabilize the linearity and one-way nature of it. Pregnancy might end without becoming a parent. Miscarriages, for example, cannot be understood through most tracking applications, as there is no option of tracking pregnancy or miscarriage in the researched MFTAs. Once the body becomes pregnant, tracking through these apps is not possible anymore. This leaves a lack of possibilities for tracking the multiplicity of imaginary, sexualized, gendered, and technologically augmented bodies (Kroker, 2012). Even in a merit of apps that are specifically geared towards pregnancy tracking, pregnancy loss cannot be accounted for (Andalibi, 2021). This means that users need to delete their app to avoid the continuation of visualization of their lost pregnancy and to stop receiving notifications on the progress of growth. In the few cases where it is possible to add the loss, previous pregnancy data just becomes deleted, rather than offering a possibility to acknowledge and engage with the loss (Andalibi, 2021). Andalibi (2021) suggests that this reflects the cultural and social ecologies these apps are part of, namely ecologies in which miscarriages become individualized and tabooed rather than actively engaged with.

MFTAs are further part of shaping cultural and sociotechnical understandings of reproduction and bodies, for example, by embedding teleological schemas (Luciano, 2007) of reproduction. Thus, bringing reproductive bodies into matter through, for example, narrating when the right time to have children is not only in a particular cycle but at which stage in life. Expectations on how reproductive bodies should be acted upon and materialized are tied to cultural ideas about 'time and progression' (Franklin, 2022). When is it the right time to become a parent? What stage or life situation is best? Temporalities of reproductive bodies do not only bring norms into being in terms of which moments in one's life reproductive potential should be acted upon; it also brings into being very normative ideas of reproductive cycles that everyday life becomes acted upon and structured around. MFTAs thereby introduce a more normative and formalized temporal frame to reproductive bodies (Hamper, 2020).

In Barad's terms, coming into matter is a 'condensation of dispersed and multiple beings-times, where the future and past are diffracted into now, into each moment'. (Barad, 2015). Following that thought, reproductive bodies come into matter through MFTAs, where the past (bodily archive) and the future (becoming pregnant) are diffracted into actions in the now. Reproductive technologies are bringing reproductive bodies into being and altering reproductive temporalities. Tracking applications do not make people more or less fertile. But they create anticipation and visualize fertile moments, thereby making fertile bodies that can be acted upon. They are also remaking what a reproductive body is and moving bodies towards a reproductive future. Through collecting data in the present, predictions about future fertile

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potential are being made and anticipated by the user, affecting actions in the present (e.g. diet, sex, and doctor visits). Through MFTAs, these futures are visualized and acted upon, as bodies are becoming known as reproductive (Hamper, 2022).

In our exploration of the relationships between bodies, apps, data, and reproduction, we understand MFTAs not as singular way of making sense of fertility but as used together with other technologies, such as tests, thermometers, online forums, and analog notes. MFTAs are thereby part of an ecology of technologies that are used to make sense of one's fertility. Thus, reproductive bodies are complexly entangled in technologies, self-knowledge, and reproductive labour (Hamper, 2022). Within these entanglements of temporalities and technologies, we see reproductive bodies becoming fertile.

For example, through broader 'FemTech' developments, possible futures become intertwined with medical practices, in which reproductive bodies become spaces for constant repairs (Welsh, 2019). Infertile bodies are only temporarily 'broken' as, through technological intervention, everybody can get pregnant (Welsh, 2019)—in theory. In practice, however, some bodies will never become pregnant, partly by their own choice, but also due to the social and local situation they are moving within. Do they have access to healthcare? To inclusive healthcare? And in some cases, even technological advancement cannot make up for the historical medical neglect of the (female) reproductive organs that still leads to misconceptions and treatment errors. That is to say, the past lingers in the reproductive body in multiple ways. Not only our own past, and the decisions that we have made throughout our life course that might make it harder or easier for us to become fertile, but also decisions of the past that were not ours. The body inherits how reproduction has been studied in the past, especially how the uterus has been understudied in the past still affects the knowledge we (do not) have today. Fertility tracking gears us towards a hopeful future by contributing with our data in the present, to make future research more attuned and inclusive to the needs of diverse bodies and reproductive scenarios, and filling this historical research gap. However, we should remain cautious of the harm designs that are based on normative and under-researched understandings of embodied reproductive temporalities might do, even with the good intent of filling knowledge gaps.

CONCLUSION

This chapter has shown how specific FemTech developments, such as MFTAs, are entangled in a broader ecology of fertility sense-making. Empirically, we have engaged with the three tracking applications: Clue, Tilly, and Drip, as well as online forums in which users are making sense of their data and experiences together. We have shown how MFTAs represent and organize reproductive time, how they build datafied relations to pasts and futures, and how users become oriented towards temporalities that are embedded within broader social and cultural narratives of reproduction. We have further explored how people engage in collective practices to make sense of their fertile potential and find ways of 'queering' their temporalities.

Based on these explorations, we propose that future MFTAs should be designed with a more holistic purpose in mind: inclusive and accounting for a plurality of bodies, experiences, and

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temporalities. But as Barad (2015) pointed out: it is not about making ‘trans or queer into universal features [...]. The point is to make plain the undoing of universality’. In other words, the question might not be about embracing other marginalized groups into these tracking spaces, but the mere idea that reproductive bodies can universally be tracked, categorized, and predicted is to be debated. However, we also want to take seriously users’ need for objective sense-making about their reproductive bodies. We therefore propose that inclusive design might not completely abandon normative representations of temporalities but engage with them through intersectional and multiple perspectives. Thus, allowing to make sense of reproductive temporalities as entangled and non-linear.

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