RESEARCH ARTICLE

Hacking the Cycle: Femtech, Internalized Surveillance, and Productivity

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Abstract

Femtech refers to a growing range of technologies that aim to address health needs typically associated with women's bodies, such as maternal health, fertility, menstruation, sexual wellness, or contraception. We examine a specific popular femtech product, cycle tracking apps, as an instrument of self-surveillance for greater productivity. Our analysis is grounded in the phenomenology of temporality—we understand workplace surveillance technologies as advancing an internalized sense of time discipline, generating a personal experience of time as a constant call to improve one's workplace productivity. We then examine how the same dynamic reveals itself in the vocabulary and functionality of popular cycle-tracking apps. Our paper contributes to the existing feminist critiques of femtech, namely, the examination of cycle-tracking apps as promoting a false sense of empowerment and separating users from self-knowledge of their bodies. We argue that cycle-tracking apps perpetuate the attitude that menstruators need to manage their cycle for the sake of reliable participation in productivity demands, creating a disconnect between their internal experience of the temporality of menstruation and external pressures.

Keywords Femtech · Cycle-tracking apps · Surveillance · Productivity · Menstruation

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1 Introduction

Adapting and disrupting one's biological rhythms to the demands of productivity is not a new phenomenon, and examples of it are not hard to come by. Sleep has become an industry aiming to improve worker productivity (Barbee et al., 2018). Drugs are commonly prescribed, used, and abused to increase focus on work tasks and overcome bodily and mental fatigue (Malík & Tlustoš, 2022; Sussman et al., 2006). Dietary habits and routines are shaped by the demands of one's work schedule (Souza et al., 2019).

It is difficult to dispute the fact that our political economy affects our relationship to our bodies. This fact, however, should not lead one to accept or imagine a romanticized vision of the past in which biological rhythms were more "natural." Instead, this fact points out that human biology evolved within an era quite removed from the invention of an industrial, free-market economy. Put another way, our basic biological functions developed during a time free from the demands of modern productivity. This disjunction between our biology and modern economic theory has been coined "evolutionary mismatch" by some economic theorists (Burnham, 2016). This mismatch between human biology and neoliberal productivity demands has resulted in the creation of numerous corrective measures. It is through these measures that one begins to see the invention of technologies that aim to "overcome" human biology.

Our paper examines cycle-tracking apps as an example of a technology that serves as this kind of corrective measure of one's bodily demands, i.e., as an instrument of surveilling and disciplining one's body toward improved workplace productivity. Our analysis is grounded in the distinction between lived time, as theorized by the phenomenologist Eugene Minkowski, and time discipline, an important concept in the sociology of labor. Making use of this distinction, we highlight how time discipline is realized through workplace surveillance technologies. Through our analysis, we challenge the core assumption of "femtech," a term used to describe a range of technologies that aim to address women's health needs. More specifically, we argue that while femtech presents itself as a platform to reform the problematic relationship between technologies and women's bodies, a thorough critique of popular cycle-tracking apps—an instance of femtech—reveals that these technologies nudge users to track their menstrual cycles for the specific purpose of increasing their productivity. Due to its cyclical nature, menstruation is a temporal phenomenon within the context of one's life; cycle-tracking apps, then, become clock-like in that they dictate when a person needs to manage and track their menstrual cycle to improve their productivity. Hence, we maintain that cycle-tracking apps (1) perpetuate the perspective on menstruation as a problematic event to be managed for the sake of productivity rather than "lived through," (2) promote a commodified idea of self-care as a response to demands of time discipline, and (3) produce self-knowledge that supports the internalized goals of time discipline.

Importantly, our analysis does not aim to make normative claims about those who use cycle-tracking apps by labeling their use as "wrong." Nor is our focus to claim that cycle-tracking is a problematic practice *tout court*. Rather, our analysis aims

to examine how cycle-tracking apps perpetuate the neoliberal assumption that menstruation must be overcome for the purpose of improving workplace productivity, where neoliberalism refers to the prevalent global economic system in which free and competitive markets determine the productivity demands of workers (Harvey, 2005; Telford & Briggs, 2022).

2 Feminist Critiques of Femtech

Women's bodies have historically been vulnerable to surveillance and discipline imposed via means of science and technology. For example, the process of giving birth was historically primarily under women's control. While modern medicalized birth increases the safety of birth, it also results in medical interventions that are at times perceived as unnecessary by the people giving birth, thus generating feelings of decreased bodily autonomy (Bergeron, 2007; Johanson et al., 2002; Shaw, 2013). As another illustration, the introduction of oral contraceptives into American life inspired competing feminist interpretations. On the one hand, enthusiasm surrounded the undeniably revolutionary effect of allowing women to make reproductive decisions independently of their sexual partners. On the other hand, there were worries about oral contraceptives presenting yet another possible means of patriarchal control over women's bodies and fears of the misuse of birth control for class and race-driven eugenic ideologies (Carson, 2018; Gordon, 1983). Even today, contraceptive counseling frequently portrays women's bodies as unruly and in need of controlled regimens and self-policing (Bertotti et al., 2021).

The relatively new field of femtech is positioning itself as a response to this historically contentious and problematic relationship between women's bodies and their medicalization through science and technology. "Femtech," a term coined in 2016 by Ida Tin, founder and CEO of cycle-tracking app Clue, refers to what Tin then predicted would be "an expanding category of technology that serves the vast opportunities that exist for female health" (Tin, 2016). More specifically, femtech refers to a range of technologies that address health needs typically associated with women's bodies, such as maternal health, fertility, menstruation, menopause, pelvic health, sexual wellness, contraception, cervical cancer, and breast cancer (Kaplan & Menking, 2021; Nayeri, 2021). Contrary to the history of science and medical technology, which centered the male body as the model whose needs are attended to, femtech promises to finally deliver that kind of attention and care to women (Cleghorn, 2022).

Tin's, 2016 prediction about the great market potential of femtech was correct—the current market size of femtech is estimated to be between $500 million and $1 billion (Kemble et al., 2022). As femtech became a booming market within medical technologies, a substantial critical debate emerged about one of the femtech products that made its way firmly into women's lives: menstrual and fertility cycle-tracking apps. Critiques of cycle-tracking apps frequently draw on feminist technoscience and ethics of technology, and we can roughly categorize the concerns that they raise into five broader areas: reliability and accuracy, data privacy and data monetization,

lack of governmental regulation, gender-stereotypical and non-inclusive design and marketing, and perpetuation of patriarchal domination over women's health.

Researchers have challenged the claims about the medical reliability and accuracy of cycle-tracking apps (Jacobs & Evers, 2023; Moglia et al., 2016). Ovulation tracking apps, designed to work either as a natural form of contraception or as fertility support tools, have been especially shown to overpromise on the scientific basis of their methods and predictions (Freis et al., 2018; Johnson et al., 2018; Hough et al., 2018).

The second set of concerns focuses on the need for better protection of the privacy of sensitive user data, as cycle-tracking apps prompt users to input information about very intimate aspects of their lives (Jacobs & Evers, 2023; Gross et al., 2021; Shipp & Blasco, 2020). Worries about data privacy of cycle-tracking apps have only increased in the United States due to the Supreme Court overturning *Roe v. Wade* (Garamvolgyi, 2022). A popular cycle-tracking app, Flo, has responded by launching an "anonymous mode," allowing users to use the app without any personal identifiers (Korn, 2022).

An issue closely related to data privacy is data monetization. Cycle-tracking apps sell user data for research and advertising purposes, which raises worries about users' lack of awareness of these practices and proper anonymization of user data (Gross et al., 2021). For instance, in a recent case, the Federal Trade Commission penalized fertility app Premom for failing to notify users about "the unauthorized disclosure of their unsecured individually identifiable health information to third parties," which the FTC claimed violated the Health Breach Notification Rule (Ovulation Tracking App Premom Will Be Barred from Sharing Health Data for Advertising Under Proposed FTC Order, 2023). In response to concerns about insufficient data privacy and predatory data monetization, calls have emerged for more substantial and systemic governmental regulation of femtech (Taylor, 2021).

The final two sets of critiques are closely related to the gendered nature of cycle-tracking apps. As several scholars pointed out, the design and marketing of these apps appeal dominantly to traditional feminine aesthetics (Jacobs & Evers, 2023; Kressbach, 2021). The apps work with the idea of a "normal" woman as cis-gendered and perpetuate heteronormative perspectives on sex and romantic relationships, excluding trans and queer users (Corbin, 2020; Hendl & Jansky, 2022; Jacobs & Evers, 2023). As a result, cycle-tracking apps reinforce harmful stereotypes about gender and sexuality, which is a goal contradictory to the self-knowledge and self-empowerment that users are supposed to gain through them (Corbin, 2020; Hendl & Jansky, 2022). Some scholars argue that this is not a coincidence—the final family of criticisms of femtech focuses on the fact that these "revolutionary" technologies addressing women's health are firmly embedded in the male-dominated tech culture, with male investors and male designers leading the femtech industry (Gross et al., 2021). In this sense, femtech can be seen as a continuation of, rather than a break from, the patriarchal dominance over women's bodies through science and technology.

Our critique in this paper draws on some of the existing debates outlined above—namely, the understanding of cycle-tracking apps as selling a false sense of empowerment and separating users, under the guise of science, from self-knowledge of

their bodies. In our analysis, we focus specifically on the use of apps for tracking the symptoms of the menstrual cycle as opposed to fertility and pregnancy tracking. This is because the dominant features of the app typically change depending on the purpose of the tracking that the user prioritizes, and consequently, so does their experience of tracking. For example, as Josie Hamper notes, fertility tracking itself becomes a form of reproductive work for the users as they try to understand their bodies specifically *as* reproductive. This knowledge is then applied to the effort of determining one's reproductive future (Hamper, 2020). When it comes to the specific use of the apps for the tracking of the menstrual cycle and the associated symptoms, we understand cycle-tracking apps as perpetuating the attitude that a menstruator needs to manage their cycle for the sake of their reliable participation in neoliberal productivity demands. This is accomplished by the apps removing menstruation from the domain of lived time into the domain of time discipline—the underlying framework of our analysis explained in the next section of the paper.

3 Lived Time and Time Discipline

It is well established that technology has altered the way in which an individual experiences temporality. A ready example of this can be found in technological advances in commercially available internet services. At the turn of the century, a download would be considered quick if it fell within the 10–20-min range. Presently, in the era of instantaneous streaming, waiting beyond one minute for a video or image to download would be an unacceptable burden for most people. All of this is to say that as technology advances, so too does our experience of time.

In recent years, certain technologies have encroached upon our personal temporality in a more overt manner. More specifically, various health applications and wearable technologies track and measure our biology in order to determine whether our rhythms and routines fall within a range that has been classified as "healthy" (Maturo & Gibin, 2022; Monteleone & Day, 2023). These technologies have transformed our embodiment insofar as previously unmeasured but personally understood bodily phenomena have now been transformed into objective measurements that normatively demarcate a person as either healthy or unhealthy (Conrad, 1992; Crawford, 1980).

One unambiguous example of this transformation is that of sleep. "A good night's rest" is a personally understood phenomenon that correlates to the routine event of a nightly sleep. However, through the use of wearable technologies, what was once understood as a "good night's rest" could be shown to be deficient in certain metrics (i.e., body temperature, heart rate, etc.). Hence, what was once categorized as a benign temporal event—nightly rest—has been transformed into a data set where the quality of rest is tied not only to desired health outcomes but also framed in instrumental terms as a pathway to increased productivity (De Cristofaro & Chiodo, 2023; Lyall, 2021; Robbins et al., 2022).

Similar to sleep, which follows a temporal routine (i.e., per night), menstruation can be understood as a temporal event in that it follows a cyclical pattern (i.e., per month). The term "period" reinforces the temporal significance of menstruation,

linguistically positioning it alongside phrases used to denote a personal and temporal relevance: "a period of my life." The temporal character of menstruation emphasizes the need to analytically approach the topic of cycle-tracking apps in a manner sensitive to the concept of lived or personally experienced temporality. This being the case, the goal of this section is to introduce the dialectic that arises when a temporal event—such as menstruation—is viewed as being both something uniquely personal as well as a barrier to workplace productivity. This dialectic ultimately revolves around the interplay between two concepts: lived time and time discipline. The rest of this section focuses on elucidating these concepts in greater detail.

3.1 Lived Time

Turning our attention first to lived time, we can narrow our focus to the work of the French psychiatrist and phenomenologist Eugene Minkowski. We can understand Minkowski's project as the bringing together Edmund Husserl's and Henri Bergson's influential investigations of temporality. Through Minkowski, Husserl's notion of temporality as an inner stream that holds together our conscious experiences is married to Bergson's notion that a "vital impulse" provides a structure and direction to all forms of life. This leads Minkowski to propose that our temporality (i.e., our inner stream of conscious experiences) is structured by our personal impulses (i.e., the goals, values, and habits that shape us into the person we are). Minkowski illustrates this point by describing a person's progression toward certain accomplishments (Minkowski, 1970, 45). For instance, when an author sets out to write a book, they imagine finishing the first paragraph, the first chapter, and so on. These imaginations of one's personal accomplishments are represented to us in a visual (i.e., spatial) manner within the mind. However, it is evident that we do not see our lives in terms of granular progress (e.g., I finished this sentence, then I finished this sentence, ad nauseam). Rather, we understand our lives in terms of the projects and themes that tie our granular accomplishments together. Put another way, our lives are determined by personal impulses that structure our unique understanding of time and its significance in our lives.

Minkowski's analysis of lived time is particularly useful as it allows temporal events to be realized in terms of a personal context rather than in a detached, scientific, or objective manner. This is critical for a temporal understanding of menstruation because it is evident that no two periods are the exact same. While the biology undergirding menstruation may remain relatively consistent, the context of one's life evolves and shifts with the passage of time. As such, menstruation is necessarily a personal occurrence in that it is bound to the subjective-temporal contexts of each individual menstruator. In this way, menstruation is a temporal phenomenon not in the sense that we can measure its duration using minutes, hours, and days but rather in the sense that people who menstruate have their temporal structuring impacted by the symptoms associated with their cycle. Thus, menstruation becomes a temporal phenomenon endued with personal meaning: A set of symptoms that are to be interpreted within the personal and cultural context of those who experience them. Critical menstruation studies, an emerging field of scholarship, seeks to recapture

menstruation as this kind of lived experience best examined through narrative as opposed to strictly biological or medical investigations (Bobel, 2020).

3.2 Time Discipline

The collapsing of lived time into the rigidity of a work schedule has been referred to as "time discipline" by the sociologist E.P. Thompson. Thompson's work focused on the enforcement of time discipline on workers during industrialization. Thompson specifically examines capital's tendency to discipline workers for not adhering to rigid time schedules:

> Enclosure and the growing labour-surplus at the end of the eighteenth century tightened the screw for those who were in regular employment; they were faced with the alternatives of partial employment and the poor law, *or submission to a more extracting labour discipline* (emphasis added, Thompson, 1967, 78).

As Thompson points out, this unyielding enforcement of time discipline by capital ultimately backfired as the issue of time gave workers a common cause to organize around; shorter workdays, overtime, and time-and-a-half became the oft-cited justifications for strikes and walk-outs. Despite this, what remained was the assumption that "working hours" were to be understood as a time of productivity. If workers are "on the clock," they are expected to produce value for their employer. Thompson follows Max Weber in pointing out that this belief in the rigidity of established working hours stems from the puritanical maxim that "time is money." In other words, through hourly pay, workers became convinced that time is, literally, money.

Thompson contends that this enforcement of working hours by capital resulted in time discipline becoming internalized by workers. Through self-regulation, workers largely adhered to rigid schedules established by capital. However, Thompson questions whether this internalized time discipline is necessary within post-industrialized societies that have seen drastic improvements in rates of poverty:

> If Puritanism was a necessary part of the work-ethos which enabled the industrialized world to break out of the poverty-stricken economies of the past, will the Puritan valuation of time begin to decompose as the pressures of poverty relax?... Will men begin to lose that restless urgency, that desire to consume time purposively, which most people carry just as they carry a watch on their wrists? (Thompson, 1967, 95).

While Thompson's question is rhetorical, it seems evident that recent history has responded to this question in the negative. Nevertheless, Thompson's question reveals that time discipline is a contingent feature of economic activity. In other words, productivity is not bound by the necessity to adhere to time discipline. This is significant, as it shows that what perpetuates time discipline is not economic necessity but rather the constant surveillance of workers by capital.

As will become clear throughout this paper, time discipline transforms temporal events as lived personal experiences into that which needs to be overcome and

managed to improve one's overall workplace productivity. We established earlier that menstruation is a temporal event that is necessarily situated within the unique contexts of one's life. However, menstruation is also a process that has historically been subjected to the tension between intimate bodily experience and its attempted scientific and technological management and control. Thus, by introducing time discipline, we can understand menstruation as transformed into a barrier that potentially diminishes one's "on-the-clock" time. To put this another way, time discipline imposes a temporality upon a worker distinct from their own personal experience of time. Therefore, when a worker experiences a temporal event that is personal in nature—such as menstruation—they find themselves in direct contradiction to the temporal demands of an economic process that is ultimately indifferent to an individual's subjective temporality.

This transformation carries a normative weight, as it exemplifies what Deleuze had coined as "societies of control." For Deleuze, a key indicator of control is the ability to transform discrete individuals (i.e., persons) into continuous "dividuals" (i.e., sets of quantifiable data) (Deleuze, 1992, 5). In a society of control, workers are expected to view themselves not in terms of personhood, but rather in terms of datasets and measurements that are abstractions of the person themselves. We contend that time discipline accelerates this transformation of individuals into dividuals. As will be shown, workers internalize the need to transform their lived time into a dataset that can be analyzed (i.e., track themselves through apps). The goal of this data analysis is an assessment of whether a user can improve certain characteristics or habits associated with their health and well-being (e.g., sleeping patterns, activity levels, etc.). However, within the neoliberal economic environment, health is inseparably linked to productivity such that improving productivity often falls under the guise of improving worker health (Loeppke et al., 2009; Stewart et al., 2003). As the United States Center for Disease Control puts it: "Healthier employees are more productive" (CDC, 2021).

To put all of this in the context of cycle-tracking apps, menstruators are being asked to consider themselves not as persons capable of understanding menstruation within the context of their own lived time but rather as being in need of a tool that converts each cycle into a set of data that can be used to guide and establish patterns of behavior that are better suited to workplace productivity. Cycle-tracking apps, then, perpetuate a belief common within neoliberal societies: workers need to enact an agenda of control upon themselves in order to continue to be a part of or participate in these societies. That is, within a neoliberal society, workers must see themselves as amalgams of continuous data points rather than collective wholes (i.e., persons). Thus, the time discipline inherent in tracking one's menstruation results in the datafication of the menstruator.

While it could be argued that cycle-tracking apps allow their users to "get by" in an economic system that punishes absenteeism and decreases in workplace productivity, it should be recognized that the permissibility of "getting by" in such an economic system does not address the more fundamental question of whether such a system—and the technologies that enable or perpetuate it—are inherently problematic. While a thorough critique of neoliberalism is beyond the scope of this article, our focus remains on a constantly emerging feature of such an economic system: the

transformation of workers into individual data for the purpose of improving workplace productivity. Drawing again from Deleuze's discussion on societies of control, this practice of demands that workers view themselves as an amalgam of data points that must constantly be recorded and updated through self-surveillance.

4 Time Discipline and Workplace Surveillance Technologies

The previous section introduced the dialectic between lived time and time discipline, indicating how cycle-tracking apps transform lived time into quantifiable data to establish control over one's biology. This section will focus on a practice necessary for this aforementioned transformation to occur: surveillance. We will introduce the concept of internalized surveillance, which grounds our argument that cycle-tracking apps can be understood as a continuation of the milieu of technologies that drive the internalization of neoliberal productivity demands.

The practice of workplace surveillance began during the period of rapid industrialization that marked the nineteenth and twentieth centuries. As Rosenblat, Kneese, and boyd point out, surveillance arose as a solution to the new management problems that arose from industrialization (Rosenblat et al., 2014). More specifically, as factories began to employ thousands of workers, it became challenging for companies to manage the increasing size and pace of production effectively. Under these novel circumstances, surveillance became a way to ensure that workers were meeting the productivity levels demanded of them by their employers. As will soon be discussed, this initial surveillance eventually resulted in the creation of technologies specifically focused on increasing work productivity.

The conceptual support for the modern form of workplace surveillance can be found in Fredrick Taylor's *The Principles of Scientific Management*. In this work, Taylor argues that if left alone to complete a task, workers will do so inefficiently. To amend this inefficiency, workers need to be watched, organized, and directed by a managerial class that can use scientific methods to promote and enact greater efficiency and productivity. Ultimately, this "science" depended on, as Robert Kanigel writes, an "unholy obsession with time, order, productivity, and efficiency" (Kanigel, 1997, 19). For our purposes, we can understand that Taylorism amounted to the enforcing of time discipline by the managerial class. A specific task was to be performed in a specific way *in a specific amount of time*. To accomplish this, managers needed to be allowed to surveil workers and their pace of work. In more vulgar terms, a worker sacrificed their privacy for the promise of a wage.

Standing apart from Taylorism is the surveillance of workers' private lives and habits. This form of surveillance is now referred to as Fordism, which stems from its initial implementation at the Ford Motor Company. In 1914, the Ford Motor Company established its Sociological Department as part of its wage increase to $5 for all factory workers. As an added stipulation for this wage increase, workers at the factory would have to allow agents from the company to enter their homes and allow them to inspect, amongst other things, the home's cleanliness, personal finances, and family dynamics. The company justified such intrusions on a worker's personal life as necessary to create a more "well-rounded life" for

workers, improve factory safety, and decrease worker turnover rates (Snow, 2014; Ford Sociological Department & English School, n.d.).

This old phenomenon of Fordism is performed through new means in a post-industrial economy, with employers relying less on managers and more, as Kristie Ball reports, on "the increased use of personal data, of biometrics, and of covert surveillance" (Ball, 2010, 91). Employers use digital technologies to monitor workers' keystrokes, emails, badge swipes, employee interactions, steps, location, etc. (Ajunwa et al., 2017; Ball, 2010). This neo-Taylorism makes use of the ever-increasing amount of surveillance technologies to ensure that employers are getting the most out of *worker's time*. Even when a worker is presumed to be "off-the-clock," their time may still be monitored by their company.

These digital information and communication technologies that allow a more all-encompassing form of workplace surveillance also enable the internalization of a need for self-surveillance. Workers are encouraged, if not required, to use applications and software that track their effectiveness in completing professional tasks through time-tracking apps, manage their projects more effectively through to-do list apps, and increase their motivation to work through distraction-blockers or habit-tracker tools. In the vein of Ford's idea of a "well-rounded" worker, workplace benefits are often connected to applications and websites that encourage workers to set personal wellness goals and participate in wellness challenges. This phenomenon is known as "participatory surveillance," where "workers are expected to aid employer surveillance by using productivity applications and wellness programs that employers proffer as beneficial to the workers' interests" (Ajunwa et al., 2017, 739).

Consequently, many of these productivity tools continue to affect workers' lived time even when they are off the clock. As Julie Cohen argues, participatory surveillance strives to exempt workplace surveillance from legal and social control by using gamified and personalized forms of self-monitoring to encourage reliable participation (Cohen, 2016). In this sense, participatory surveillance is "unapologetically and unironically" tied to neoliberal biopolitics, where any proposed regulation of such self-surveillance is seen as a form of dangerous paternalism (Cohen, 2016, 7). Additionally, productivity apps blur the line between "off-the-clock" and "on-the-clock" time even further since they are frequently marketed as instruments for personal goals rather than just professional ones, and workers use them to manage a variety of tasks beyond the work proper. In the age of personal smart devices and working from home, workers quite literally take these instruments of time discipline everywhere they go, making both spatial and mental separation between work and leisure difficult, if not impossible. It is through these surveillance technologies that one is introduced to the dialectic occurring between lived time and time discipline. In other words, through these technologies, a worker's lived time is transformed into a rigid schedule that is constantly undergoing scrutiny for the purpose of maximizing the amount of time they spend on tasks and habits associated with improved workplace productivity.

Thus, the internalization of time discipline has been only magnified by the participatory forms of surveillance facilitated through the productivity tools market. As we will argue in the next section, cycle-tracking apps exist on this continuum of

instruments of internalized time discipline, priming their users to comply with neo-liberal productivity demands.

5 Cycle-Tracking Apps and Productivity

In our analysis of cycle-tracking apps, we focus on three apps with significant global user bases: Clue (11 million monthly active users), Eve by Glow (11 million), and Flo (50 million) (About Clue, 2023; Tiffany, 2018; Flo Health Appoints New Executive and Launches Privacy & Security Advisory Board to Further Its Commitment to Protecting Its 50M Monthly Active Users' Data, 2023). Our analysis shows that cycle-tracking apps impose a sense of time discipline on menstruation: The app alienates the menstruator from their menstruation; it is something to be tracked, monitored, and recorded rather than something the menstruator *lives through* and contextualizes within their own life and conception of private, personal time. Cycle-tracking apps aim to surveil the menstruator and, in doing so, internalize the idea that menstruation is something that one needs to do something about. In this way, menstruation becomes a project in itself, something that one must focus on and address. The goal of this project—of "dealing with" menstruation—can be understood to serve the drive to increase or improve productivity. Below, we unveil these dynamics as supported by the way cycle-tracking apps approach absenteeism caused by menstrual symptoms, self-care needs arising out of the experience of menstruation, and self-knowledge generated by cycle-tracking.

5.1 Cycle-Tracking and Absenteeism

The modern history of menstruation has largely been shaped by an attitude that portrays menstruation as a problem to be overcome. Focusing specifically on the workplace, menstruation was viewed as an issue of absenteeism occurring among women workers. Menstrual hygiene products, such as tampons and sanitary pads, were often marketed as solutions to this absenteeism. As the historian Sharra Vostral notes, "[Tampax ads] reinforced the necessity of reduced absenteeism, and how Tampax would help women stay at work during their periods" (Vostral, 2010, 108). Vostral also explains how these ad campaigns coincided with companies often employing counselors specifically to deal with "the 'problems' of female employees." These counselors helped women workers on a range of issues spanning from finding affordable housing to securing access to abortion care, all in the hope of improving their work performance (Vostral, 2010).

The logic of cycle-tracking apps does not diverge from this historical understanding of menstruation as an issue for workplace absenteeism. While cycle-tracking apps offer tracking that is, on its surface, devoid of any pre-formulated set of goals for the user, a closer look at the context of the tracking—and the goals formulated by the users as well as the companies behind the apps themselves—reveal that addressing neoliberal productivity demands is one of the important motivations of these apps.

In their empirical study, Epstein et al. identify, among others, awareness of one's body, understanding of one's body's "reactions to different phases of their cycle," and preparedness as the main reasons why people track their cycle (Epstein et al., 2017). Epstein et al. note that these goals use tracking as a method of observation rather than control: there is "little or no control" over "how and when" things that are being tracked occur (Epstein et al., 2017, 17). Mikki Kressbach adds that this type of health tracking is, therefore, distinct from gamified health and fitness self-tracking, which is goal-driven rather than observation-driven (Kressbach, 2021). As we have discussed earlier, this type of gamified goal-driven tracking is also characteristic of participatory forms of workplace surveillance (Cohen, 2016). Kressbach observes that while goal-driven tracking encourages benchmark-setting and behavior modifications, observational cycle-tracking does not aim to help users "change or influence their cycles" (Kressbach, 2021, 249).

However, as Karen Levy pointedly argues, "the act of measurement is not neutral," and the data collected through intimate forms of surveillance, such as cycle-tracking apps, are embedded in sociocultural, not just technological, contexts (Levy, 2015, 687). While it is true that the data fed into cycle-tracking apps are not used to generate goals and benchmarks automatically for the user, the perspective on these apps as observational is challenged by the surrounding contexts in which the users employ these apps. A recent study conducted by researchers at Flo Health, which produces the Flo cycle-tracking app, presents the findings of a cross-sectional survey conducted amongst Flo users (Ponzo et al., 2022). It purports to have found that the Flo app is useful insofar as it reduces instances of absenteeism and improves worker productivity. More specifically, the study found that Flo users reported that the app achieved this by making them feel more aware of bodily signals related to their cycle, supporting them during their period, and enabling them to manage their menstrual symptoms better (Ponzo et al., 2022).

Thus, this study shows us that if we zoom in strictly on the things that are being tracked through these apps by the users—such as one's physical symptoms or moods—it is true that they fall into the category of observations rather than benchmarks. However, once we look at the users' *beliefs* about what this kind of tracking does for them, they reveal the goal-driven layer of this form of tracking. Namely, Flo users in question channeled these observations into the goal of reducing absenteeism and maintaining productivity at work. Beyond the users' reported beliefs, the objective of the study itself was resoundingly framed in ways that reveal a suggested transition from observation to goal-generation facilitated by cycle-tracking apps: The "digital health interventions focused on women's health" were examined for its potential to fill out the gap in employer-led initiatives to work absenteeism caused by menstruation (Ponzo et al., 2022, 1). Both the findings and the study's framing can thus be understood as an attempt to conceive of these apps as tools used to improve workplace productivity.

Furthermore, the transition from observational to goal-driven tracking mirrors the dynamics of the transition from lived time to time discipline. While observational tracking suggests that we are monitoring our body as it lives *through* different temporal phenomena, such as period, goal-driven tracking introduces an element of *demand* into the picture, a demand that, as was explained in sections on

time discipline and surveillance, is translated into self-imposed internalized forms of surveillance. This self-imposed surveillance is a consequence of the precarity of employment within a neoliberal economic environment (Standing, 2014). As has been pointed out by many theorists, a quintessential feature of economic life in neoliberalism is facing instability caused by cyclical economic crises (Carchedi & Roberts, 2018; Fisher, 2009). Hence, individual employment in such an environment is viewed as always under threat, as companies regularly and routinely engage in mass lay-offs or downsizing to prepare for and adapt to such crises. In such an environment, workers are presumed responsible for doing all that they can to protect themselves against the constant threat of unemployment. Moore and Robinson argue that there is a link between anticipation of economic precarity and acceptance of participatory self-tracking, which we discussed earlier in our paper: participating in self-tracking towards increased productivity gives workers a sense that they have some sense of control over the larger economic environment that is outside of their control (Moore & Robinson, 2016, 2777). As such, improving workplace productivity is seen as an "ought" for workers who worry that their employment might be threatened by the next economic crisis.

With respect to cycle-tracking apps, this precarity of employment in our present economic environment exposes a logic of internalized time discipline that takes the form of the following conditional statement: "If a menstruator uses a cycle-tracking app, they will be better able to maintain their workplace productivity during menstruation." This first premise is followed by a normative assumption commonly held among workers: "I ought to maintain my workplace productivity." This then leads to the conclusion that "I ought to track my menstrual cycle." While there are, of course, ways other than cycle-tracking of achieving the former, as we have discussed earlier in the section on workplace surveillance, internalized surveillance through self-tracking is currently the culturally dominant form of surveillance.

As we have discussed previously, menstruation is generally regarded as a barrier to workplace productivity, and menstruating workers were historically regarded as less productive than their non-menstruating counterparts. This attitude towards menstruation turned it into a problem rather than an event occurring within the menstruator's lived time. Cycle-tracking apps continue this problematization of menstruation insofar as they generate a set of benchmarks motivated by internalized time discipline, in the sense that the app turns menstruation into something that needs to be dealt with for the sake of maintained productivity.

5.2 Self-Care as Internalized Time Discipline

Going beyond the popular and academic articles focused on the link between cycle-tracking apps and productivity demands, the apps themselves present their functionality in ways that place them firmly as instruments of internalized time discipline.

Potential users of Flo are welcomed with a message that tracking their cycle will help them understand that it can "affect everything from your mood to your energy levels" (Flo For Tracking Cycle, 2023). Similarly to Flo, Clue invites its users to "Live in sync with [their] cycle" and explains that one's "cycle affects things like

mood, skin, energy levels and much more," and Eve by Glow encourages them to take control of their cycle (Clue Period & Ovulation Tracker with Ovulation Calendar for iOS, Android, and watchOS, n.d.; What's Eve by Glow?, 2023). Both Clue and Flo rely extensively on the vocabulary of prediction, patterns, accuracy, and symptom management. The ultimate goal of tracking here is, once again, not merely observational in the sense of a better understanding of one's body. Instead, the goal quickly shifts to the language of management. The users are told that they can "calculate and predict symptoms ahead of time, getting … prepared for the days ahead" and "feel more prepared and aware of your body signals with personalized insights" (Flo—Ovulation Calendar, Period Tracker, and Pregnancy App, 2023).

The need for preparedness and personalized insights to deal with the symptoms of the menstrual cycle, of course, raises a follow-up question of what it is that the user needs to be more prepared for. In combination with the ability to set up a wide range of cycle-related reminders, personalized "Analysis" (Clue) and "Insights" (Flo) features, and the call on the users to "plan some self-care on low energy days and are always ready for cramps before they hit," the apps reveal that they operate on the assumption that one's cycle needs to be managed in line with the demands of productivity (Flo For Tracking Cycle, 2023). Specifically, we want to argue that the notion of planning "self-care breaks" directs the users toward the expectation to adhere to neoliberal productivity demands.

It needs to be emphasized that in the context of these apps, self-care is a form of commodity. As an illustration, Eve by Glow features a prominent "wishlist" section of the app, which allows users to add desired products related to their tracking goals, including "wellness & relaxation" self-care products (Glow, 2023). With one click, the app lets the user visit the specific online store where the desired item is for sale. Through this app feature, Eve by Glow makes the connection between self-care needs generated by menstrual symptoms and the commodified response to these needs via increased consumption very explicit. The commodification of health is a widely examined topic in the literature (Conrad & Leiter, 2004; Esposito & Perez, 2014; Henderson & Petersen, 2002). Similarly, "the self-care industry" has been extensively analyzed as appropriated by capitalism in recent years (Caldera, 2020; Forbes, 2019; Kim & Schalk, 2021). This 1.5 trillion-dollar wellness industry prompts us to practice self-care by buying more products that will help us relax more efficiently and effectively (Callaghan et al., 2021; Kisner, 2017).

However, beyond self-care being an occasion for increased consumption in the context of these apps, we can also understand self-care breaks promoted by cycle-tracking apps as perpetuating the logic of time discipline. Self-care is a practice that originates in the Black radical feminist tradition, most famously articulated by Audre Lorde in her essay "A Burst of Light," reflecting on her life with breast cancer (Lorde, 2017). Interestingly, part of this journey for Lorde has been about distancing herself from the healthcare industry, which she no longer saw as serving her—the same system that femtech purports to disrupt in order to better respond to women's health concerns. Lorde conceived of self-care as an inherently political project standing in opposition to neoliberal productivity demands. The body needs self-care not in order to "re-enter" the productivity cycle; on the contrary, self-care is an expression of a firm rejection of the kind of demands that take an excessive toll

on one's body in the first place. In contrast to this, in the context of cycle-tracking apps, self-care is a break in the other sense of the term: It is not a radical break from the system that subjects our bodies to neoliberal productivity demands. Instead, it is a quick break that aims to replenish the body so that it can get back to being productive. This interpretation is further supported by the fact that through the app, self-care itself becomes something to be planned in line with the predicted "low energy days."

If we understand self-care alongside Lorde's original conception of it rather than through its current commodified form, then self-care belongs firmly into the domain of lived time and ought to be experienced in line with the highly personal context in which our bodies demand care and rest, a context that does not abide by the externally imposed and internalized requests of the time discipline. Consequently, the notion of "readiness" and "preparedness" for one's "low energy days" undermines the idea of self-care, as it introduces the notion of discipline into an act that is supposed to free our body from the demands of this discipline in the first place. "Self-care days" are not an antithesis to neoliberal productivity demands. On the contrary, in the context of cycle-tracking apps, calls for self-care further legitimize time discipline by perpetuating the belief that an occasional moment of self-care is all that one needs to take a step back from the demands of productivity. In reality, these kinds of breaks are the most one is *allowed* to ask for in the context of cycle-tracking apps, where menstruation needs to be managed in line with the day-to-day insistence of internalized time discipline.

5.3 Time Discipline and Self-knowledge

In the cases of both Flo and Clue, the users are asked to trust the apps because they rely on "up-to-date science" (Clue Period & Ovulation Tracker with Ovulation Calendar for iOS, Android, and watchOS, n.d.). Flo welcomes each new user with a comprehensive health questionnaire tied to the goal that they set for their tracking, with the promise that you will "become an expert on you" through the use of the app (Flo Health UK Limited, 2023). Clue users are invited to "learn about [their] body from the data" they feed into the app, which, in combination with Clue's "science-based articles," will allow them to make "informed health choices" (Clue Period & Ovulation Tracker with Ovulation Calendar for iOS, Android, and watchOS, n.d.) Both apps feature an analysis section where the tracked data are turned into insights, graphs, reports, averages, and statistics (Flo Health UK Limited, 2023; BioWink GmbH, 2023). Establishing a more harmonious relationship between science, technology, and women's bodies is, as was discussed above, one of the selling points of femtech, and cycle-tracking apps highly emphasize the potential of self-empowerment via newly acquired science-backed knowledge about one's body.

However, as Tereza Hendl and Bianca Jansky argue, this kind of self-empowerment assumes that the pre-app state of users is that of being detached from the knowledge of their bodies and that proper self-knowledge should be mediated through the app (Hendl & Jansky, 2022). There is, therefore, a paradox at the center of the self-empowerment offered by these apps: The offer to understand oneself

better through science-backed analysis of one's cycle perpetuates the myth of women's bodies as a mysterious force of nature—the exact myth that femtech is claiming to challenge. The mystery can only be revealed and tamed through "digital behavioral technology" that exists in a "big data economy" (Hendl & Jansky, 2022, 41). Eve by Glow incorporated a GlowGPT into the premium version of their app, introduced as an "AI assistant trained to answer women's and baby health-related questions. Available 24/7" (Glow Premium, 2023). In addition to Big Data, Generative AI is becoming another mediator of knowledge of one's body within these apps. In this sense, the cycle-tracking apps can be understood as *perpetuating* the othering of women rather than closing the gap in their inclusion as science and technology beneficiaries. While the cycle-tracking apps do not position women against men as the norm by which they are measured, they do, as Bethany A. Corbin points out, position users against the idea of a "standard" or "normal" menstruator through the datafication and standardization of symptoms associated with the cycle (Corbin, 2020).

In addition to the important critiques above, the relationship between cycle-tracking and knowledge generated by tracking is also informed by a sense of time discipline. Time discipline discipline "infiltrates" self-knowledge acquired through the cycle-tracking apps because, as we have argued above, internalized time discipline currently constitutes the dominant mode of how we experience temporality in a post-industrial society. Indeed, several authors point out that the knowledge mediated by self-tracking is always skewed by the sociopolitical and economic context in which it is embedded. Karen Dewart McEwen argues that even though self-tracking technologies do not have a predetermined outcome of what will be discovered through tracking, the self-tracker is encouraged to "get to know herself… in terms of her ability to work and her levels of productivity" because they function in the context of contemporary capitalism (Dewart McEwen, 2018, 247). Ford, Togni, and Miller focus on users of cycle-tracking apps who used them to learn about their "hormonal health" (i.e., a wide set of symptoms and experiences associated with one's cycle). The authors point out that while users do consider the apps useful in learning about and being in touch with their body and its processes more, this knowledge is shaped by the background of "neoliberal labor markets and surveillance capitalism" (Ford et al., 2021, 58). This meant that the users at times felt that they ought to apply the knowledge of their hormonal health towards the kinds of things appreciated by this regime, such as management, productivity, discipline, and predictability (Ford et al., 2021). Laetitia Della Bianca introduces the concept of "cyclical-self fashioning" to describe a similar phenomenon experienced by users of fertility-tracking apps, where the interventions inspired by self-tracking are always intertwined with existing normative values (Bianca, 2021).

Adding to the authors above, we argue that the politically and economically dominant time discipline perpetuated by gamified and internalized forms of self-surveillance is another important context that shapes the sense of self-knowledge and self-empowerment gain through cycle-tracking apps. The apps themselves convey a sense of time discipline with their emphasis on expertise, analyses, predictions, and patterns that turn knowledge of menstruation from the domain of lived time, i.e., a subjectively experienced temporality, into the quantifiable units of time discipline. Additionally, in line with the authors discussed above, it is important to

also recognize that users themselves already exist in a set of social, political, and economic circumstances that impress upon them the demand to abide by time discipline. In turn, this set of circumstances conditions users to apply their self-knowledge towards neoliberal productivity demands in order to satisfy time discipline. In this sense, the users do not experience deviation only from the standard or ideal menstruator that cycle-tracking apps evoke through their built-in ideal of self-knowledge, as argued by Corbin. There is also an *additional* deviation that needs to be tackled through tracking: Namely, the deviation of one's menstrual symptoms from the internalized demands of time discipline.

Ultimately, just as self-care, the self-knowledge and self-empowerment that cycle-tracking apps offer to their users becomes another instrument in the mission to tame one's cycle so that the menstruator remains, through internalized discipline, properly productive. In the context of the cycle-tracking apps, moving menstruation from the domain of a personal event to the domain that needs to be understood via scientific knowledge and datafication for the sake of its better management completes the process of turning menstruation from something that is "lived through" to something that is "dealt with."

6 Conclusion

Our analysis of cycle-tracking apps has uncovered that they perpetuate a logic of time discipline that aims to convince menstruators that menstruation must be *overcome* in order to match neoliberal productivity demands that are indifferent to their biological concerns. In a system where productivity is one of the highest social values, menstruation is first problematized and then managed as an obstacle toward achieving this value.

Cycle-tracking apps as a solution to workplace productivity are also aligned with the currently dominant forms of workplace surveillance on the question of *who* takes responsibility for failing to meet the productivity benchmarks: the workers themselves. While it is the industrialized economy that problematized menstruation as an issue of absenteeism—not the menstruators themselves—the responsibility for managing symptoms of menstruation that interfere with workplace productivity falls strictly on the person who menstruates. With a few exceptions, such as Spain passing a bill in 2023 guaranteeing three days of paid leave per month during menstruation if the worker produces a doctor's note, menstruation is a productivity problem that menstruator is expected to solve without governmental or employer support (Bello & Llach, 2023).

Previous work has contended that tracking and surveillance for the purposes of health can offer avenues for a re-articulation of the values of autonomy, solidarity, authenticity, self-making, and self-improvement (Kristensen & Ruckenstein, 2018; Sharon, 2017). Indeed, while one can find many cases in which individual users do not use cycle-tracking apps for the purpose of improving workplace productivity, it remains evident that these tracking technologies collect user data specifically for the purposes of "problem-solving." That is, the "what-for" of tracking, and cycle-tracking apps in particular, necessarily consists of the collection of data in order to solve

or correct a particular issue (e.g., absenteeism and productivity concerns related to menstruation), as we have discussed earlier. In ideal conditions, individual subjects could identify particular problems within their lives and then use the insights gathered from tracking technologies to solve these problems, but the reality of our social, economic, and political conditions is such that the problems facing individuals are often *caused* by these social, economic, and political conditions (e.g., workplace absenteeism, internalized hyper-productivity, and healthism). Given this, there is a persistent concern as to whether individual users can use self-tracking technologies without also engaging in and accepting postindustrial capitalism's problematization of certain behaviors and ways of living. As a result, there remains a healthy level of skepticism as to whether users of cycle-tracking apps will be able to resist the background of time discipline that is built into them.

In the case of cycle-tracking apps, it is unclear if users will be able to disentangle personal ends from the ends established by their social, economic, and political conditions. What seems clear is that this disentangling will require reflection on the "problems" that cycle-tracking apps seek to solve. Such reflection will have normative significance insofar as one understands problematization to be a contingent process rather than one borne of necessity (Koopman, 2013, 2014). In simpler terms, we have the ability to accept, reject, and resist the notion that a certain way of living is a "problem." By critically examining the way cycle-tracking apps are used, we retain the ability to recapture their usefulness not as a tool of internalized time discipline but rather as a way to reengage, reinforce, and recapture autonomy and sovereignty over one's lived body and lived time.

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