



Towards a morally sensitive, inclusive and empowering design of period trackers

An ethical analysis

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Abstract

This thesis provides an ethical analysis of period trackers, assessing their role in being an ethically justified tool to empower women. Subsequently, empowerment would be established as the result of women increasingly gaining knowledge and agency over both their menstrual and overall health through the usage of period trackers. This thesis argues that period trackers contribute to women's empowerment by: i) facilitating self-care, ii) promoting equal and inclusive healthcare access, iii) challenging stigmas concerning menstrual and sexual health and iv) bettering the socio-economic status of women. However, this thesis simultaneously identifies ethical drawbacks associated with period trackers that could disempower women. These drawbacks include: i) inadequate representation of different women, ii) women experiencing epistemic injustice, iii) the perpetuation of harmful narratives, and iv) the exploitation of women's intimate data. In response to these concerns, this thesis suggests a threefold solution in order to mitigate these aforementioned ethical drawbacks. This solution proposes that: i) designers adopt an intersectional perspective, ii) designers are facilitated in prioritizing reliable data management, iii) designers foster moral competence in their design process. Finally, if these considerations are taken to heart, this thesis concludes that the usage of period trackers is indeed an ethically justified means to use in achieving women's empowerment.

Keywords

Period trackers, empowerment, inclusivity, morally sensitivity, self-care, health-care access, reducing stigma, socio-economic empowerment, representation, epistemic injustice, conservative narratives, data exploitation, intersectionality, data management, moral competence

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Introduction

Contemporary biomedicine systematically overlooks and neglects women's health issues, including menstrual, hormonal and reproductive health (Elahi et al., 2023). For an extended period of time, and still, the male body is taken as the default mode for medical research within biomedicine (Elahi et al., 2023).

However, this results in the unfortunate consequence that the specifics of women and their health remain unexamined and misunderstood, which culminates in women being misdiagnosed or not feel seen or heard by medical professionals (Elahi et al., 2023).

That said, FemTech was introduced as a kind of countermovement within the landscape of technological innovation to fill this knowledge gap within biomedicine. FemTech was recently valued at twenty-two billion dollar and the expectation of a 15 percent grow rate for the coming 5 years (Burt-D'agnillo, 2022). The phenomenon of FemTech emerged in 2016 and was coined by Danish FemTech entrepreneur Ida Tin. FemTech offers various technologies like wearables and apps to track and improve women's health, in which they cover aspects such as menstrual, reproductive, sexual, maternal, and menopausal health (Almeida et al., 2020). Thus, these technologies aim to better understand and support the unique experiences and needs of women and their health (Jacobs & Evers, 2019, 2023).

Particularly, this thesis will centralize the technology of period trackers. Period trackers are used as a tool to track the menstrual cycle and thereby women can derive information about both their menstrual an overall health. Based on complex algorithms, predictions can be made about one's start and end date of period, women can track their fertile days by mapping out ovulation and lastly other physical complaints such as bloating, headaches and cramps can be monitored. Contemporary scientific research shows that the usage of period trackers amongst women is high in popularity, and now, more than ever, an increasing number of women prefer to take charge and gain knowledge about their menstrual health (Elahi et al., 2023; Kressbach, 2021)

Additionally, in women gaining knowledge and agency over both their reproductive and general health, the usage of period trackers is often associated with contributing to women's empowerment (Elahi et al., 2023; Hendl & Jansky, 2022; Jacobs & Evers, 2023). To illustrate, this empowering vision of period trackers also comes to the fore as expressed by Ida Tin, who is the CEO of the popular period tracker called Clue. Ida Tin emphasizes: "I believe that the world needs and deserves something like a female health graph, so that we can live our lives

as we desire, not in spite of our biology, but in sync with it¹.”. Another example is of the period tracker called Flo and its current mission statement is “to build a better future for female health by helping you harness the power of your body signals”². Again, the emphasis of these period trackers is laid on empowering women, to live in alignment with their menstrual cycle and to regain agency over one’s health.

However, simultaneously, an often-heard critique within contemporary scientific literature is that although period trackers are often ‘sold’ with the narrative to empower women, this technology actually falls short, or even severely undermines the idea of contributing to women’s empowerment (Hendl & Jansky, 2022). To illustrate, period trackers would be exclusive in both their rhetoric and design, only representing the heterosexual, affluent, cis-gendered, able-bodied and regular menstrual cycled women (Hendl & Jansky, 2022; Jacobs & Evers, 2019). Although these are legitimate and profound ethical concerns, we ought not to dismiss the usage of period trackers as a means of empowerment for women altogether. Hence, in this thesis, I will argue how period trackers can indeed be seen as an enabling form of technology³, that supports the empowerment of women. In this thesis, solutions are proposed to safeguard an inclusive, empowering and overall, morally sensitive period track design.

Additionally, in defining the notion of empowerment in women, I will draw on the notion of Hendl & Jansky (2022). According to them, empowerment can be defined as women gaining a deeper sense of knowledge of their bodies, having control over their own bodies and, assuming responsibility for both their reproductive and more general wellbeing (Hendl & Jansky, 2022, p. 5). Contrarily, disempowerment can be defined as the experience of a loss of personal agency within women in which the control over and taking responsibility for one’s reproductive and general health is diluted (Jacobs & Evers, 2023, p. 15).

Furthermore, as a research method, this thesis employs the framework of empowerment in analysing the ethical justification of period trackers as a means to women’s empowerment.

¹ The mission statement of Clue as expressed by the founder of Clue, Ida Tin. Obtained from: <https://helloc clue.com/articles/culture/what-promise-do-data-femtech-hold-for-female-health>. Accessed at: 2-02-2024.

² The mission statement of Flo. Obtained from: <https://flo.health/about-flo>. Accessed at: 2-02-2024.

³ FemTech and the subdomain of period trackers can be perceived as facilitating so-called 'enabling technologies'. To illustrate, the United Nations formulated several sustainable development goals in 2015, with the mission statement of achieving gender equality and to empower all women and girls through the usage of these technologies.

This is an appropriate framework to use since these technologies are designed with the intention to empower women by providing them with knowledge about their menstrual health and health more generally. Hence, it belongs as mentioned before to the mission of period tracker designers to inform women, so women can subsequently gain knowledge and agency over their health. Consequently, women are increasingly enabled to make authentic and well-informed bodily choices in such a manner that it aligns with their health preferences and values.

In this thesis, I will address my research question by asserting that within technology design, this process inherently carries certain values. Thus, in designing morally sensitive technologies, we ought to pay careful consideration into the potential transmission of certain gender biases and assumptions. In other words, people and the artefacts that they make ‘co-evolve’ (Wajcman, 2007, p. 295). This means that the material dimension of technologies actually enforces certain gender power relations (Wajcman, 2007). Specifically, this field of research occupies itself with determining how biomedical technologies actually shape and transform the identities of women and the relationship with their bodies both in positive and negative ways (Burt-D’agnillo, 2022, p. 15). This raises the question to which extent women and their usage of period trackers actually enhances their empowerment or might even disempower them. For this reason, the lens of ‘empowerment’ and respectively ‘disempowerment’ makes for an appropriate angle for an ethical analysis of period trackers. Consequently, this results in the following research question:

Are period trackers an ethically justified way to empower women?

Besides, the novel contribution that this thesis ought to make is that it provides a thorough appraisal and ethical analysis of why period trackers can indeed be seen as an ethically justifiable way to empower women. This is a claim that has not previously been subjected to sustained ethical analysis and moreover, this is a claim that is also highly criticized by some theorists. To illustrate, within scientific literature, often the narrative and potential of period trackers as a means to enhance women’s empowerment is criticized and ethical concerns and key challenges of period trackers are highlighted instead (Corbin, 2020; Hendl & Jansky, 2022; Jacobs & Evers, 2019; Kressbach, 2021). That being said, in this thesis, it will not be argued that period trackers are an end-all-be-all for preventing conception. However, I do claim that this technology can be very insightful in the sense that period trackers equip women with a deeper

sense of bodily knowledge, greater control over their health and subsequently the ability to take charge over their wellbeing.

Hence, I argue that period trackers are indeed an ethically justified tool to use to contribute to women's empowerment. Consequently, I disagree with authors that articulate scepticism to the usage of period trackers for the purpose of empowerment. Nevertheless, I do concede the urgency for significant improvements in the design of contemporary period trackers, which should include that designers: i) adopt an intersectional perspective, ii) are facilitated in ensuring reliable data management and, iii) cultivate moral competence. Hence, by adopting these principles, designers can work towards establishing an inclusive, morally sensitive and empowering period tracker design.

As for the structure of this thesis, first, I will delve into the benefits of period trackers and argument that their prospects offer valuable opportunity to contribute to women's empowerment. Second, I will shine light on the ethical drawbacks of period trackers often considered working against women's empowerment and argument that we ought to take these ethical concerns seriously. Third, I will provide a threefold solution to the previous mentioned drawbacks of period trackers to plea for my thesis that if sound ethical guidance for designers is provided, period trackers can indeed be a tool to support women's empowerment. Finally, I will close off by reiterating my thesis, providing a brief summary of my findings and lastly mention the shortcomings of my research and suggest topics for further research.

Chapter 1: Period trackers and their prospects for women's empowerment

In this chapter, first a theoretical understanding of empowerment will be spelled out. Second, potential prospects of period trackers as a means to women's empowerment will be outlined. The prospects that will be elaborated on concern period trackers as a tool for self-care, providing equal and inclusive health care access, reducing stigma concerning the menstrual and sexual health of women and lastly by potentially enhancing the socio-economic position of women. Consequently, the claim that will be made in this chapter is that period trackers provide several advantages that indeed contribute to women's journey for empowerment.

1.1 Empowerment and its theoretical understanding

First and foremost, when delving into the empowering prospects of period trackers, a theoretical framework needs to be fleshed out. First, it is important to note that the notion of empowerment is by definition a normative concept. This is the case since normativity refers to a preferred state of being, in other words, how a situation 'ought' to be and what is either morally right or wrong about the current existing situation (Driver, 2006, pp. 5–6). Applied to empowerment, we can ask ourselves how an empowered individual ought to look like and what kind of qualities an empowered individual ought to have. Now, in providing the theoretical context of empowerment, the counter equivalent of empowerment namely disempowerment needs to be defined as well. Disempowerment can be defined as the experience of a loss of personal agency within women in which the control over and taking responsibility for one's health is undermined (Jacobs & Evers, 2023, p. 15). Simultaneously, this idea resonates with the critique that is expressed by theorists stating that the usage of period trackers is medically unreliable in preventing conception and hence this technology is falsely assumed to be empowering for women (Hendl & Jansky, 2022; Moglia et al., 2016). In other words, the usage of period trackers would make women experience a loss of personal agency instead.

However, empowerment as understood within feminist ethics concerns a non-negative, non-dominant and non-controlling form of power which comes down to an individual enforcing their will upon others. Contrarily, empowerment understood from a feminist perspective, is rather seen as a positive and transformative notion that is described as a "*power-from-within*" (Hoagland, 1992, p. 118). When experiencing empowerment, women can feel a sense of "power of ability, choice and engagement" in a specific context or environment (Hoagland, 1992, p. 118).

Specifically, regarding this thesis, the notion of technology as a means to women's empowerment is centralized. Particularly, in defining the empowering force of technology and how it affects women's health, I will draw on the work of Hendl & Jansky (2022). They define empowerment by means of technology as women gaining a deeper sense of knowledge of their bodies, having control over their own bodies and ultimately, assuming responsibility for their wellbeing (Hendl & Jansky, 2022, p. 5).

Currently, the narrative concerning FemTech, and period trackers more specifically, is that start-ups and designers promise to equip women with an increased sense of self-confidence, self-awareness, autonomy and support systems in making sense and gaining control over not merely their menstrual, but health more globally (Elahi et al., 2023). Thus, this thesis aims to illustrate how the usage of period trackers by women strengthens their abilities, choices and engagement in taking ownership over their health.

Nevertheless, it must be mentioned that although empowerment is the key concept of this thesis, 'empowerment' as a normative concept is closely interlinked with concepts such as autonomy and justice as well. This is the case since these are values that again refer to a preferred state of being, of how reality 'ought' to be. For instance, autonomy is linked to empowerment since empowered individuals are typically seen as autonomous in the sense that they are capable of making their own decisions, act on their own reasons, values and motives and thus experience agency (Mishra & Tripathi, 2011). Additionally, justice is linked to empowerment as well, since empowered individuals have equal opportunities for personal growth to develop oneself and this resonates with the idea of gender equality (Almeida et al., 2020). Consequently, gender equality is perceived as fair treatment for individuals, and in this particular sense fair treatment for women.

Simultaneously, the other way around, empowered women contribute to the enhancement of women's autonomy and justice as well by both challenging and eradicating contemporary social structures which are perceived discriminatory towards women. Therefore, all these normative notions mutually shape one another and ought to be seen as a holistic groundwork, necessary to grasp the full understanding of empowerment. Now, what follows is an extensive overview on the prospects that period trackers have to offer for aiding women's empowerment.

1.2 The provision of women's self-care

First, the potential contribution to empowerment is that period trackers provide women with tools for self-care and hence women can take control and ownership over their health. Thereby, it contributes to fuel women with their “power-from-within” and hence supports their journey to empowerment. Moreover, self-care needs to be perceived as an active, knowledge-making process (Almeida et al., 2020). Hence, women and their health monitoring through using a period tracker is such an example of an active knowledge-making process. Besides, self-care is often framed as providing women with an increased confidence, self-awareness, autonomy and support networks (Elahi et al., 2023). This is equally provided by women using period trackers as well.

For these reasons, the usage of period trackers can be a valuable means for women to actively engage in self-care when tracking their menstrual cycle and overall health. Thus, period trackers help women to control and regain power over their health and thus this technology strengthens and empowers women (Hendl & Jansky, 2022; Jacobs & Evers, 2023). To illustrate, the mission statement of period tracker Clue aims to ‘demystify’ the menstrual cycle of women (Hendl & Jansky, 2022). It can be stated that the menstrual cycle fulfils a central role within period trackers, in which the fertile window, moment of ovulation and menstrual symptoms are prioritized in making sense of one's health. Additionally, the menstrual cycle of women is a reliable predictor when it comes to determining wellbeing. For example, period tracker Clue sees the menstrual cycle as “an additional vital sign, like your blood pressure or pulse”⁴. Equally, this statement has been affirmed by the American College of Obstetrics and Gynaecologists, who similarly claim that the menstrual cycle is the ‘fifth vital sign’ in predicting women's health (Critchley et al., 2020). Hence, knowledge about menstrual health exceeds the relationship of female reproduction and concerns women's health more generally as well.

Nonetheless, it would be too short sighted to state that period trackers are solely a means to track one's period. Rather, these period trackers provide self-care for women beyond the realm of menstrual and reproductive health. To illustrate, period trackers such as Flo And Clue also enable users to keep track of other health related symptoms such as headaches, bloating, insomnia and mood swings (Kressbach, 2021). Moreover, the period tracker called

⁴ Mission statement of period tracker Clue. Obtained from: <https://medium.com/clued-in/part-2-the-clue-guide-to-getting-your-period-dfb5aea6743c>. Accessed at: 03-01-2024.

'Period tracker' tells its users that their app can be used as a personal period diary that helps women to get in shape, lose weight, and stay healthy (Hendl & Jansky, 2022). It is therefore not fair to reduce the utility of period trackers as 'solely' a means to track one's period. Rather, period trackers enable women to take care of both their health and lifestyle. As previously mentioned, often the female body and its specific health needs have been neglected within biomedicine and the usage of period trackers is a valuable tool for women to regain their sense of health. Unfortunately, on a worldwide scale women have poorer health compared to men (Elahi et al., 2023). Hence, women using period trackers could be an effective means to keep track over their health and for women to gain confidence and self-awareness. More explicitly, period trackers help women to anticipate and adjust their behaviour to the symptoms that they experience during their menstrual cycle.

Moreover, the usage of period trackers by women could be seen as a valid steppingstone towards the development of other female oriented health apps that contribute to self-care as well. As previously mentioned, the FemTech market is expansively growing and will continue to do so. Hence, opportunities for women to take care over their health and hence empower themselves would increase. To illustrate, whereas the FemTech market started out as mainly providing tools for reproductive care, however, currently new FemTech applications are being designed to treat osteoporosis and cardiovascular and neurological disease (Elahi et al., 2023). This is a valuable development since certain diseases manifest themselves in woman differently compared to men (Elahi et al., 2023). In that sense, the period tracker market could function as a steppingstone for the development of other healthcare related apps contributing to women's wellbeing.

Furthermore, women actively using period trackers also contributes to sustainable patient and medic contact which promotes self-care as well (Almeida et al., 2020). This is the case because if women increasingly can take care of themselves by understanding how their menstrual cycle affects their overall health, this would undoubtedly be beneficial in the contact with medical providers as well since they are being better medically understood. Frequently, in contact with physicians, menstrual complaints such as bloating, headaches and mood swings are overlooked and not taken seriously (Almeida et al., 2020). By women using period trackers, they can be seen as active participants in gaining ownership over their health (Almeida et al., 2020). All-in-all, period trackers can hence be a means that contributes to a positive development in which women increasingly are able to take care of not only their

menstrual health, but their overall health as well. Equally, this meets the principal claim that period trackers are indeed a justified means to enhance women's empowerment.

1.3 The enabling of equal and inclusive healthcare access

Second, period trackers contribute to empowerment since they could provide women with both equal and inclusive health care access. Unfortunately, on a worldwide scale, women have on average a poorer health and less access to tailormade healthcare (Elahi et al., 2023). This is especially the case because there exists a so-called gender knowledge gap concerning the specific healthcare needs and desires of women (Elahi et al., 2023).

This knowledge gender gap can be explained by the fact that unfortunately, the majority of data within healthcare is focused on the male body and the male life cycle. The medical landscape is heavily men dominated, and that said, men-biased data and scientific knowledge is reflected within the daily care practice (Elahi et al., 2023). This is problematic since in that sense the female body has long been medically neglected. Put more strongly, it is only since 1993 that women are officially included by medical law to participate in clinical trials to approve of certain medication (Bennett, 1993). Moreover, until this day, there is a marginalized amount of knowledge concerning the manifestation of cardiovascular disease within women (Elahi et al., 2023). Furthermore, the specific medical research devoted to health products and services dedicated to enhancing women's health constitutes of only 4 percent (Elahi et al., 2023). Besides, pharmaceutical companies have a revenue model that mostly prioritizes the desires, needs and financial gain of stakeholders that are primarily focused on bettering men's health instead (Elahi et al., 2023). That said, this medical context simultaneously explains the lack of knowledge and data concerning women and their health specifics.

However, if women would use period trackers, they can contribute to the closing of the gender data gap since they provide a useful platform by collecting comprehensive data of women's bodily health, both menstrual and overall health indicators. To illustrate, the period tracker Flo states that by women using their app, they directly contribute to "helping bridge the gender research gap, advance cutting-edge science and build a better future for female health"⁵. Additionally, Criado-Perez (2020) points out that when women are increasingly included in data analysis, the prioritization of preventing women's specific disease will be

⁵ Mission statement of the period tracker Flo. Obtained from: <https://flo.health/science-and-research>. Accessed at: 02-02-2024.

taken seriously as well. Besides, in terms of inclusivity, when different sorts of women such as women of colour and of disability use period trackers as well, tailor-made advice can be generated. This is the case because the algorithm of period trackers is based on each individual woman and her needs. Thus, this would make the data even more precise doing justice to all diverse types of women. Thus, granted that different women actively use period trackers and hence contribute to the reduction of the gender data gap, the healthcare system eventually becomes more equal and inclusive. This is a necessary prerequisite for women's empowerment as well. Granted that women have equal health care access; they are simultaneously better equipped to take responsibility and make well-informed decisions about their own health. Consequently, this again resonates with the idea of period trackers contributing to women's empowerment.

1.4 The reduction of menstrual and sexual stigma

Third, period trackers may contribute to the reduction of stigmatization concerning menstrual and sexual health of women. This is again an important ingredient for women's empowerment since the ability to freely discuss important matters about menstrual and sexual health is necessary for women to learn about their bodies and hence being able to make well-informed health decisions. This can be facilitated since period trackers break the taboo to make these concepts open for discussion and hence empowering women. To illustrate, period tracker Flo provides an online forum in which women can anonymously discuss their menstrual experiences such as the average length of their periods and the symptoms that they are experiencing during their cycle (Hendl & Jansky, 2022). In that sense, women can feel a sense of kinship with other women in bonding and deriving knowledge over an intimate subject such as menstrual health. Hence, period trackers could have a liberating function for women ((Hendl & Jansky, 2022).

However, this point is not taken for granted without any fight. To illustrate, different theorists argue that the anonymous deliberation of taboo subjects will not lead to reduction of menstrual stigmatization altogether. Rather, period trackers would provide a poor alternative to actual physical conversations and real relationships between people conversating about sensitive topics such as menstrual health (Elahi et al., 2023; Hendl & Jansky, 2022). To illustrate, according to Kressbach (2021) period trackers such as Flo and Clue could simultaneously have the opposite effect by 'concealing and alienating' women from their menstruating bodies by providing an online platform. Kressbach (2021, p. 3) argues that

period trackers promote bodily alienation in relation to menstruation since frequently, these apps employ ‘euphemistic humour and iconography’. In that sense, these period trackers that use so-called menstruation jokes are a means to reinforce the stigmatic conception of menstruation. Hence, menstruation is framed as a subject that ought to be seen as rude or dirty to talk freely about in real life conversations. Thus, period trackers that facilitate an online platform to talk about menstruation anonymously would not be sufficient enough to altogether break the taboo. Also, this idea presumes that online conversations about menstruation would be worth less compared to real life conversations about taboo subjects.

Although this is an important claim, nevertheless, this objection overlooks that we already live in a highly technologized and online mediated society, and our primary form of communication is predominantly online. This objection overlooks this matter by not acknowledging the value of discussing sensitive topics such as menstruation in an online environment. However, I do agree that period trackers should not be seen as an ‘end-all-be-all’ to the reduction of taboo. Nonetheless, period trackers can be a useful tool to lower the threshold for women to eventually, out in the open, talk about stigmatized phenomena such as menstrual health. Thus, period trackers can be perceived as valuable and an accessible steppingstone for women eventually engaging in real life conversations about menstruation. To give a concrete example, a successful online environment that facilitates the conversation of a sensitive topic amongst women is called *Fertile Thoughts*. This is an online forum that discuss the topic of infertility. Infertility among women is likewise a stigmatized topic. However, this platform is one of the most popular and universally used websites that holds a strong online community in which infertile women openly talk about their experiences with infertility (Jansen & Saint Onge, 2015). This example proves that talking about taboo in online environment can actually have influence in which women feel seen and understood, and therefore it is too short-sighted to conclude that period trackers and their online communities of diminishing the taboo regarding menstrual health would not suffice.

Furthermore, period trackers empower women ‘beyond’ the realm of menstrual health as well by making sexual health open for discussion. Additionally, this technology also facilitates conversations about sexual problems such as women who are unable to orgasm or want to discuss insecurities concerning their vulva (Hendl & Jansky, 2022). That said, period trackers liberate women and their specific health experiences with menstrual, sexual and relational health by providing a platform via which these sensitive topics can be discussed. In this sense,

the usage of period trackers is a justified means to break menstrual and sexual taboos and to facilitate women with a feeling of empowerment, in which they feel the ‘power-from-within’, to converse about these often, highly stigmatized phenomena.

1.5 The enhancement of women’s socio-economic position

Fourth, the usage of period trackers by women can enhance their socio-economic position which consequently empowers them. The Organisation for Economic Co-operation and Development (OECD)⁶, defines socio-economic empowerment within women as an increased capacity to get access to economic resources such as job opportunities, financial services, properties and are simultaneously equipped with the appropriate skill set and market information. Hence, the socio-economic status of women is an important dimension to empowerment, since women who are financially independent and stable have better access to different healthcare resources which subsequently enables them to make better well-informed and authentic health choices⁷. Hence, this idea also resonates with the overarching claim that by bettering the socio-economic position of women, they are increasingly empowered and thus the usage of period trackers is a justified means to facilitate this.

The socio-economic empowerment of women can be facilitated by providing female role models within the realm of FemTech. Female entrepreneurs operating in the technical landscape could function as role-models to influence other women to become active within the STEM-field (Science, Technology, Engineering and Mathematics) as well. According to research, more than 70 percent of the FemTech initiatives consist of period trackers and these are innovated by women (Hendl & Jansky, 2022). That said, with the growing market of FemTech, more women could acquire so called high earning positions within the STEM-field and subsequently, this could enhance the socio-economic position of women.

Nonetheless, the current underrepresentation of women in the STEM-field poses new challenges. This is the case since society is undergoing a digital transformation in which STEM-professions become of high importance (González-Pérez et al., 2020). The current development of period trackers takes places in a highly male dominated context, especially

⁶ Socio-economic empowerment of women as explained by The Organisation for Economic Co-operation and Development (OECD). Obtained from: <https://www.oecd.org/social/gender-development/womenseconomicempowerment.html>. Accessed at: 02-02-2024.

⁷ Report of McKinsey Health Institute: Closing the women’s health gap: A \$1 trillion opportunity to improve lives and economies. Obtained from: <https://www.mckinsey.com/mhi/media-center/new-report-highlights-one-trillion-potential-of-closing-womens-health-gap>. Accessed at: 02-02-2024.

within the STEM-spheres. Within STEM-professions, women remain absent due to a perpetual problem of gender inequality, meaning that women working within the STEM field often encounter gender discrimination, must cope with lower social capital and often feel they do not fit into the academic climate (Casad et al., 2021). It would be unfortunate if women would miss a career path in STEM-jobs, since the employment growth rate is three times faster than non-STEM-jobs (Langdon et al., 2011). Increasingly, in the near future, more jobs will arise within the STEM-field that necessitate a technical background. Thus, it is of utmost importance that more women are represented within the STEM-field to prevent women from 'being behind' in the labour market and to prevent the increasing gender gap⁸

Nevertheless, the number of women working in the STEM- field increases gradually (Elahi et al., 2023). Additionally, scientific research shows that women in 'power' attract other women because these first named women function as role models and thus female entrepreneurs designing period trackers could become an effective means to inspire other women (González-Pérez et al., 2020). To illustrate, period tracker pioneer Ida Tin, who once invented the period tracking app of Clue inspired a lot of other women to pursue a career in STEM. Moreover, more 'women in power' tend to prioritize women's specific health needs, since often female entrepreneurs design products for their own health desires (Elahi et al., 2023). To illustrate, Koning et al., (2021) conclude that within medical research, the requested patents funded for by women within biomedical research are frequently focused on women's health, in contrast to patents requested by men, in which women's health is often not prioritized (Koning et al., 2021).

Hence, the bettering of the socio-economic position of women profoundly contributes to women's agency to make well-informed decisions concerning their own health. In this scenario, women are financially independent and stable and thus have better access to different healthcare resources. In other words, women are enabled to make powerful decisions concerning their wellbeing that are wholly their own. It is for this reason, that female entrepreneurs in the realm of period trackers could function as a role model, being an effective means to encourage other women to aspire a career in the STEM-field as well and to facilitate a 'sense of belonging' for women aiming to pursue a career in the STEM-field (González-Pérez et al., 2020, p. 2). That said, role models inspire and lessen the stereotypes

⁸ Information gathered from the OECD report: Bridging the digital gender divide. Obtained from: <https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf>. Accessed at: 02-02-2024.

and biases that are omnipresent for women in the overly male-constituted STEM-field (González-Pérez et al., 2020).

All-in-all, in this chapter, it was argued first, that period trackers provide women with tools for self-care. Second, this chapter argued that period trackers contribute to inclusive and equal healthcare access for women. Third, it was argued that period trackers reduce the stigmatization concerning menstruation and women's sexual health. Fourth, it was claimed that period trackers contribute to the enhancement of the socio-economic position of women by inspiring other women to pursue a career within the STEM-field as well. All these arguments confirm the overarching claim that period trackers are indeed a justified means to use in order to enhance women's empowerment. As of now, we will turn to considering the potential ethical downsides of period trackers in which they would actually undermine women's empowerment.

Chapter 2: Period trackers and their ethical drawbacks for women's empowerment

As seen within the previous chapter, the usage of period trackers carries the prospect of certain advantages for women in terms of empowerment. However, in this chapter, it is indicated how period trackers can actually undermine the empowerment of women. In what follows, diverse potential ethical pitfalls of period trackers will be discussed. Subsequently, this will result in recommendations that will be made for creating inclusive and morally sensitive period trackers.

The ethical drawbacks that will be discussed in this chapter consist of the failure of representation, the contribution to epistemic injustice, the perpetuation of harmful narratives and lastly the exploitation of women's data for commercial incentives. I make the case that, unless remedied, these drawbacks associated with the usage of period trackers by women can thoroughly undermine women's empowerment. The claim that will be made in this chapter is that we ought to take these following ethical concerns of period trackers and their usage seriously in order to avoid disempowerment for women instead.

2.1 The failure of representation

First, one severe ethical concerns are that period trackers might not be able to facilitate the representation of all women and for that reason jeopardize women's empowerment. Although several period trackers such as Clue and Flo explicitly claim that they are inclusive, stating that their apps can be used by all individuals with periods or that the designers try to adopt an intersectional approach to inclusion, continuously improving representation and diversity in our content⁹

Nonetheless, almost all FemTech innovations including period trackers are designed within a specific sociocultural environment that is dominated by young and white men (Hendl & Jansky, 2022). As research points out, designers who engineer within a heavily male dominated environment tend to design technology with one stereotype user in their minds (Elahi et al., 2023). Hence, applied to designers of period trackers, engineers could endorse the idea of a certain 'stereotype' user of a period tracker such as the heteronormative, cis-gendered, able-bodied and affluent women. Hence, the endorsement of this stereotype user could result in the normalization of certain gender roles and expectations that are taken as the reference point within period trackers (Hendl & Jansky, 2022; Jacobs & Evers, 2019; Kressbach, 2021). Often, the

⁹ Diversity & Inclusion Statement of period tracker Flo. Obtained from: <https://flo.health/diversity-and-inclusion-statement-for-app> . Accessed at: 04-02-2024.

need to “modify people to fit technology” (Almeida et al., 2020, p. 4) makes that a lot of different women do not feel represented and understood by novel technologies.

Theoretically speaking, as argued by Lupton & Jutel (2015), technologies need to be perceived as artefacts which are shaped by the sociocultural circumstances of society. In other words, they “employ carefully chosen images and discourses to represent their use and function” (Lupton & Jutel, 2015, p. 130). Put differently, in the design of period trackers two things become clear, these apps: i) presume certain capacities of its users, ii) embody these capacities via design.

However, in the design of period trackers, transgender, non-binary or gender fluid individuals may not feel represented by period trackers since they often can not relate to the used design format which is often pink and contains floating clouds, hearts and flowers. Moreover, heterosexual images are displayed, and the used pronouns are displayed as (*‘Hey girl’*). Therefore, period trackers would not be inclusive enough and subsequently disempowers women (Hendl & Jansky, 2022; Jacobs & Evers, 2019). To illustrate, many users of period trackers could experience this format as not fitting to their experience. For instance, a lesbian women may not be interested in having a ‘fertile window’ but is not able to remove this feature from her period tracker. Equally, painful human experiences such as miscarriage and abortion seem heavily overlooked and neglected within the design of period trackers as well (Jacobs & Evers, 2019). Moreover, the same amounts to women with irregular menstrual cycles.

However, these experiences ought to be integrated within period trackers since they resemble fundamental human experiences that tell a great deal about both the reproductive and global health of women. As a result, women who feel like their stories remain untold by period trackers may feel vulnerable and excluded since they cannot rely on the medical advice that these period trackers give, since the ‘normal’ and ‘regular’ menstrual cycle is taken as the default point of reference. Hence, these women have a higher risk of becoming pregnant which makes them extremely vulnerable and more so, this restricting and menstrual norm could also lead to the damaging of self-image for women who cannot relate to this menstrual norm. Moreover, scientifically reliable period trackers are considered expensive, and this would mean that only affluent women would be able to purchase reliable period trackers (Elahi et al., 2023). That said, Columbia University Medical Center investigated 108 period apps and concluded that 95 percent of the non-monetised apps gave unpredictable and

imprecise advice (Moglia et al., 2016). These non-monetised apps were not provided with scientific oversight which is a mandatory ingredient for providing women with medically reliable advice concerning their menstrual cycle and health. That said, only affluent women would be able to use trustworthy monetised period trackers, which subsequently undermines the accessibility of period trackers meant to empower every women, regardless their financial capacity.

Consequently, considered all these different dimensions, women that deviate from the contemporary ‘norm’ used within these period trackers might feel excluded by using period trackers and could feel disempowered instead. That said, the gathered data of period trackers can hence be a sole reflection of an exclusive group of women that meet certain criteria as mentioned above in which only certain menstrual experiences and types of information are treated as valuable information (Hendl & Jansky, 2022). Subsequently, the unique experiences of women do not always fit in the data reduced reality facilitated by period trackers. Hence, the failure of the representation of diverse types of women using these period trackers could implicate that the lack of representative and inclusive data upholds a certain ‘menstrual norm’ and make women even more vulnerable instead of feeling empowered. Thus, these women would be disempowered in the sense that a period tracker would not help them in regaining control over their reproductive wellbeing and health more generally. Above all, it is the responsibility of designers to make sure that the diversity of women using period trackers is safeguarded within their design.

2.2 The rise of epistemic injustice

Second, period trackers might contribute to women having an unhealthy dependence on technology for monitoring their health. This could entail that women might trust the information provided by period trackers more in comparison to their own bodily experiences with menstruation. This in turn can lead to so-called bodily alienation (Hendl & Jansky, 2022). This is the case since both the menstrual cycle and health of women more generally is framed as a ‘biologically deterministic’ entity that can only be understood through women’s usage of period trackers (Hendl & Jansky, 2022, p. 13).

However, this implies that women using period trackers might feel detached from their own bodies, since they are not trusting their own bodily experiences but rather rely on the data provided by the algorithms of period trackers. Hence, women experiencing bodily alienation is another example of how period trackers could make women vulnerable by undermining the

authority of women in making sense of their own bodies. Often, the knowledge of women about their health is discredited as seen within feminist literature which describes the patriarchal history within medicine (Hendl & Jansky, 2022). Put differently, in this sense women are not perceived as so-called ‘authorized knowers’ of their bodily health (Almeida et al., 2020; Fricker, 2007). Rather, they are perceived as ‘objects of knowledge’ instead, which subsequently degrades the idea of women seen as legitimate knowledge owners in terms of their own bodily health. This comes down to the idea of epistemic injustice as defined by Fricker (2007). Particularly, the idea of what Fricker (2007) identifies as testimonial injustice is relevant. Now, testimonial injustice defines itself as a form of epistemic injustice that arises when a person’s narrative is disbelieved or dismissed due to the existing biases and assumptions of the listener (Fricker, 2007). Concretely speaking, this idea of women dismissing their own bodily experiences manifests itself within period trackers since this technology is based on following algorithms that leave little to no room for expressing subjective experiences. Thus, period trackers assign more authority to the existing algorithms in the app instead of centralizing the subjective experiences of women describing their own feelings, experiences and judgements concerning their health (Hendl & Jansky, 2022).

Moreover, by relying on the algorithmic predictions of period trackers, women increasingly come to understand themselves as sources of data (Kressbach, 2021). To illustrate, Hendl & Jansky (2022, p. 15) state: “While the apps purport to empower women with knowledge about their bodies, the empowerment is conditional on acquiring data and using the apps’ services” (Hendl & Jansky, 2022, p. 15). However, the female body and its health experience encompasses so much more and can not solely be reduced to quantified information provided by the data of period trackers. That said, instead of feeling empowered by the usage of period trackers women might feel insecure, dependent, and gain a reduced sense of the self through its usage.

2.3 The perpetuation of harmful and conservative narratives

Third, women’s empowerment might be undermined since period trackers could unintentionally perpetuate and reinforce traditional narratives about the role of women in society and thereby disempower women. Thus, in that sense the usage of period trackers would not be an ethically justified manner to empower women. By contrast, it would not fuel women with a liberating narrative, rather, a very restrictive and biologically deterministic one. This is the case since period trackers and their design would force women into ‘planning’ their life alongside their menstrual cycle. To illustrate, it could give suggestions as to when the ‘best’ timing would be for women to become pregnant or when she should invest in her

career, in alignment with her menstrual cycle and fertility (Corbin, 2020; Elahi et al., 2023). As mentioned before, the design of period trackers takes place in a technological landscape in which the socio-cultural context mainly exists of young and white males (Elahi et al., 2023). In that manner, period trackers could become another means to make women and their health ‘fit’ within a dominantly male oriented society (Elahi et al., 2023). Also, the uphold of a ‘stereotype’ female user can perpetuate the narrative of the ‘normal’ and ‘healthy’ women, namely the women who identifies as heterosexual, white, cis-gendered, regular menstrual-cycled and highly educated. That said, women who deviate from this embedded norm as seen within period trackers might feel unseen and neglected. This is an important realization since according to Jasanoff (2016, p. 1) “Our inventions change the world, and the reinvented world changes us.”. Jasanoff (2016) describes the phenomenon of technology that actually changes and reinvents the way we perceive our world. Subsequently, applied to the design of period trackers we ought to critically scrutinize how their design displays and in result changes the way society perceives women and understands narratives about womanhood.

Besides, one of the narratives that is permanently present within period trackers is that of the woman occupied with her fertility because she either would want to get pregnant or rather prevents getting pregnant. Above-all, pregnancy is obviously the central underlying theme. However, an overly focus on either supporting or avoiding pregnancy within women could perpetuate the idea of the sole purpose of women being perceived by society as a sort of ‘birthing machine’ in which women are doomed to the so-called ‘tyranny of reproduction’ as explained by Firestone (1970). Firestone (1970, p. 213) explains this concept as the oppression of women based upon their bodily capacities, in particular, their reproductive abilities and their value depends on it as well (Firestone, 1970, p. 213). As mentioned earlier on, the centralization of fertility in period trackers may exclude certain women who feel like that pregnancy is not their main objective in using a period tracker. Thus, this is a restricting and conservative narrative that does not serve the liberation and empowerment of women.

Furthermore, frequently the rhetoric used in period trackers has the tendency to perpetuate harmful and conservative narratives as well. Although the mission statement of a period tracker like Clue claims that it wants to: “Empower women to gain self-knowledge”¹⁰. However, simultaneously, the menstrual cycle of women is described as “something mystical” that can only be “understood” through the usage of a period tracker (Kressbach, 2021).

¹⁰ Mission statement as defined by Clue. Obtained from: <https://helloclue.com/articles/how-to-use-clue/clue-period-tracking-plus-explained>, Accessed at: 07-02-2024.

Hence, the incongruent rhetoric used for the promotion of these period trackers can thus create a harmful narrative of the ‘technology dependent woman’ in which women need to rely on period trackers to understand their bodies and to take charge over their own health. In that sense, their usage of period trackers would even create less control and agency over one’s health and consequently undermine women’s empowerment. Thus, it is of utmost importance that the biases, narratives and harmful assumptions concerning menstrual and female health are thoroughly scrutinized before they become ‘embedded’ within the period tracker as a given. This ought to be the case because these underlying assumptions can heavily influence the way that these women who use this technology think about themselves. At any case, designers ought to be morally sensitive and reflect on what kind of narratives they tell through their design.

2.4 The exploitation of intimate data

Fourth, it could be objected that due to the usage of period trackers, women and their health would be commercialised and exploited and hence women would be disempowered instead. This is the case since the most intimate data of women is gathered by period trackers. As mentioned earlier on, information pertaining whether one engages in protected or unprotected sexual activity, the nature of vaginal discharge, dietary habits and other various lifestyle choices are all gathered by these apps. Hence, this data of women can be ‘used’ as a means to commercial gain for third parties. To illustrate, recently there has been a scandal concerning the period tracker Flo¹¹, since it allegedly sold the data of millions of women to Facebook and Google between 2016 to 2019. More explicitly, this sold data was subsequently used to target the users of Flo with certain advertisements that occurred during specific moments in women’s menstrual cycle such as when a period is late. To illustrate, women could then receive advertisements about pregnancy tests or birth control options (Kressbach, 2021). In other words, female bodies are lucrative sources of data (Kressbach, 2021). Thus, the emphasis of period trackers could be on selling products instead of actually enhancing women’s health (Jacobs & Evers, 2019).

In this case, women and their intimate data are commodified, instead of women actually being in charge over their own health and being the sole owners of their data. This phenomenon is also known as surveillance capitalism and can seriously undermine the narrative of period

¹¹ The New York Times on the prosecution of Flo. Obtained from: <https://www.nytimes.com/2021/01/28/us/period-apps-health-technology-women-privacy.html>. Accessed at: 04-02-2024.

trackers being an ethically justifiable means to attain women's empowerment (Kressbach, 2021). Nevertheless, although there need to be financial incentives for tech entrepreneurs to build financially lucrative period trackers, nonetheless, it is not morally permissible to make women and their data the product instead. Rather, other sources ought to be facilitated to make sure it is financially attractive for entrepreneurs to invest in period trackers.

Moreover, the exploitation of women's data ought to be protected to prevent women from falling victim to prosecution in countries where abortion is made illegal. To elaborate, a woman's right to abortion has been a very profound steppingstone towards attaining women's empowerment. This is the case because this right reflects and safeguards the core value of respecting bodily autonomy. Put differently, women have the freedom to make their own reproductive choices (Byron et al., 2022). However, in this day and age of big data, this is a serious point of concern that needs to be taken into account. For example, recently in the United States of America, the Supreme Court decided to overturn *Roe v. Wade*. This was a law that existed since 1973 and it legally protected women who would want to terminate their pregnancy (Byron et al., 2022). However, under such societal circumstances, and if the data gathered by period trackers is not protected adequately, it could put women at risk of litigation by these mentioned law restrictions. In sum, data protection is of utmost importance to make sure that women and their intimate data remain safe.

All-in-all, in this chapter it was argued that period trackers potentially fall short in representing diverse types of women using period trackers, give rise to women increasingly experiencing epistemic injustice, could perpetuate harmful and conservative narratives and lastly jeopardize women by exploiting their intimate data. As of now, we will turn to the next chapter that will discuss how these ethical drawbacks can be prevented by offering a threefold solution to make sure that the intended goal of women's empowerment is indeed established.

Chapter 3: Towards an empowering design of period trackers

In the previous chapter, the ethical drawbacks and their potential harms for women's empowerment were discussed. Although these are legitimate concerns, in this chapter, these criticisms will be taken, and a threefold solution will be proposed. This solution comprises that designers: i) adopt an intersectional perspective, ii) sustain reliable data management, iii) cultivate moral competence.

As mentioned before, the usage of period trackers ought not to be seen as an end-all-be-all for women to empower themselves. However, granted that period trackers are designed bearing in mind certain conditions for both inclusive and morally sensitive design, they indeed can be perceived as an ethically justified tool to empower women. Specifically, the crucial role of designers is emphasized in this chapter since they hold the unique ability to influence both the potential risks and opportunities of period trackers and their prospect for women's empowerment. Put differently, designers are put "at the cradle of new technological developments" (Roeser, 2012, p. 213). The claim that will be made in this chapter is as follows: If designers uphold an intersectional viewpoint, are supported in ensuring reliable data management and enhance their moral competency, they can alleviate the ethical concerns associated with period trackers that would cause women's disempowerment.

3.1 Intersectional perspective

First, as mentioned before, contemporary and popular period trackers have a condescending and gender stereotype format. This type of period tracker is especially popular among women who identify themselves as heterosexual, cis-gendered, white, highly educated, able-bodied, affluent and regular menstrual-cycled. However, this type of period tracker does not appeal to all women and thus fails to be inclusive in representing the varying menstrual and health needs of different women.

Hence, as a proposed solution, I suggest that designers could adopt a so-called intersectional approach. By adopting an intersectional approach, the potential risk of period trackers falling short in representing distinct types of women could be minimized. So, what does it actually entail if designers would uphold an intersectional approach in their period tracker design? This would entail that designers bear in mind paying profound attention to factors such as race, gender, class, caste, religion, sexual orientation, disability, age and lifestyle factors (Jacobs & Evers, 2023). This is of importance because according to the idea of intersectionality, all these categories intersect with each other and mutually shape one another in the sense that

individuals embody diverse social identities. Simultaneously, these different social identities affect power dynamics, social interaction and individual experiences. All-in-all, it can be concluded that intersectionality is closely interlinked with establishing women's empowerment. This is the case since by interpreting women's empowerment via the profound framework of intersectionality, designers can increasingly gain a thorough understanding of the complexities of women's identity and the forthcoming potential oppression and how their design either facilitates or undermines the possibility of empowerment. In other words, when designers are fully aware of the different social identities of their users, subsequently, they can shape and code their technology in such a manner that indeed period trackers do reflect the principle of intersectionality.

Concretely speaking, how does this intersectional approach translate itself to concrete actions that designers can undertake to safeguard women's intersectionality in their design? Hence, this can be established by designers organizing opportunities of shared-decision making when designing an inclusive and morally sensitive period tracker. At all costs, it is important that the lived and intersectional experiences of women using period trackers are centralized within the design process (Almeida et al., 2020; Wajcman, 2007). This ought to be the case to again, avoid 'modifying people to fit technology' instead of 'modifying technology to fit people' (Almeida et al., 2020). If designers adopt an intersectional approach, period trackers can be aligned with women's unique bodily workings, choices, rights and access to healthcare. This can be done by designers engaging in a persisting dialogue via semi-structured interviews or focus groups with intersectionally diverse women to guarantee that the subjective and lived experiences of different women are actually resembled within the 'script' of period trackers (Almeida et al., 2020). To illustrate, in focus groups, women can discuss their experiences, needs and preferences when it comes to their preferred usage of period trackers and how these could facilitate their empowerment. A useful question could be: What do diverse types of women, especially women who feel like they 'deviate' from the stereotype period tracker user need, in order to feel represented, seen, heard and empowered when using a period tracker?

However, a legitimate objection might be that although the contemporary popular period tracker design often falls short in representing different women, nonetheless, we must not fully discredit the more 'stereotypical' period trackers such as Flo. This is the case since this period tracker is appealing to more than forty-eight million women (Hendl & Jansky, 2022). Hence, these women might actually feel empowered by using this period tracker in the sense

that it deepens their bodily knowledge and enlarges their agency. Moreover, another objection that is raised against period trackers and their potential prospect of empowerment for all women, is that these period trackers exclusively focus on individuals with a uterus. However, women's empowerment encompasses so much more than being tied to one's reproductive abilities and physical biology. That said, it is important to note that period trackers as a means of empowerment might not be a meaningful tool for every woman. To illustrate, transgender, gender-fluid or non-binary women might not feel represented and disempowered instead. It is therefore important not to contribute to a narrative of period trackers as a means to empower all women, and to be realistic about its scope and significance as a technology to attain women's empowerment.

Nevertheless, providing designers with the option to work with an intersectional approach can be a valuable tool to use in creating an inclusive and morally sensitive period tracker design. Hence, women who feel like they deviate from the default 'period tracker norm' are provided with alternative options. In that sense, designers can appeal to different 'markets', also known as a variety of women using period trackers and having varying health needs.

Second, as mentioned earlier on, an ethical drawback concerns women increasingly experiencing epistemic injustice. In that sense, women are not perceived as authorized and credible knowers of their own bodily health, rather, they are perceived as objects of knowledge in which they become highly dependent for their knowledge on the algorithms of period trackers for understanding their bodies.

In response, I suggest that the aforementioned opportunities of shared-decision-making in terms of designers engaging in interviews with women in which they can express their unique experiences would be valuable as well. However, in doing justice to the testimonial credibility of women, it is even more important that designers pay thorough attention to the imagery, rhetoric and choice architecture in designing inclusive and morally sensitive period trackers. Hence, designers ought to actively ask women for their input. As for the imagery, designers should be conscious what kind of associations different women can have with the colour pink and the condescending and jokingly design. Rather, they should facilitate the option that women who prefer to do so can make use of more neutral colours and iconography as well. Furthermore, when it comes to the used language in period trackers, designers should facilitate the availability of gender-neutral language as well. Furthermore, given the choice architecture of period trackers, designers should create the possibility for women to track their social circumstances such as stress exposure, sleep, diet, and other lifestyle factors that

influence their menstrual and overall health. In this sense, designers would not reduce women to objects of their menstrual cycle but rather approach women from a holistic view that does justice to women's individual experiences instead. Additionally, designers should facilitate space as well for asking individual questions to users in their choice architecture. This ought to be the case to make the period tracker design tailored to the experiences of different women. To illustrate, questions that designers could ask concern as to determining whether a woman is interested in becoming pregnant, how their gender can be interpreted, what sexual orientation should be centralized and what the preferred language and pronouns ought to look like. Granted that women are actively involved in the decision-making process concerning imagery, rhetoric and choice architecture, it would be less likely that they would encounter testimonial injustice.

Consequently, these women are not longer reduced to 'datafied' objects in which they are dependent for their bodily knowledge upon objective and abstract algorithms. On the contrary, in the latter scenario when women and their preferences, experience and authority in designing period trackers is centralized, these women and their word are actively treated as legitimate and credible instead.

Third, an important ethical concern is the perpetuation of conservative and harmful narratives of womanhood when using period trackers which consequently undermine empowerment. This means that designers unintentionally reinforce harmful perceptions of womanhood. To illustrate, a harmful narrative concerns women being perceived as biologically deterministic beings that need to plan their life along their menstrual cycle, in which planning for pregnancy is a main theme. Hence, in this scenario, period trackers would have an excessive focus on solely preventing conception. However, this idea jeopardizes the idea of women using a period tracker as a legitimate means of empowerment beyond the realm of conception.

In response, I propose that as a solution designers might consider investing in a diverse composition of team mostly consisting of women. To illustrate, the design team of period tracker Flo was unevenly composed since this team mostly consisted of men (Elahi et al., 2023). Simultaneously, this period tracker is frequently criticized due to its stereotypical design. Again, designers of period trackers engage in far-reaching decisions about which data is valuable collect, how data should be enumerated and how it ought to be interpreted and displayed to its users. This is all a matter of interpretation, and to make this interpretation as intersectional and inclusive as possible, an equally composed design team mostly consisting of women is a necessary ingredient to uphold intersectionality. As emphasized earlier on, to

create an inclusive and morally sensitive period tracker, it is of importance that designers take responsibility for tailoring their design to the diverse realities and preferences of women to encourage empowerment. However, this can be done adequately by incorporating more women in the design of period trackers. This is the case since as mentioned before, women tend to look at what is needed in the design of period trackers based on their own health needs and desires. It is for this reason that we need to take the importance of female role models within FemTech entrepreneurship seriously. As stated earlier, the FemTech sector is attracting more women, and this is very necessary to create a more equal and diverse team composition in the design of period trackers. Similarly, these women and their influences would result in a period tracker design that would better reflect the experiences of different women and thus their approach would be more inclusive and morally sensitive.

Moreover, to avoid the reinforcement of conservative and harmful perceptions on womanhood within period trackers, it can be of utmost value to incorporate the knowledge and expertise of different disciplines as well. Hence, interdisciplinary collaboration between period tracker designers, scientists, ethicists and humanists ought to be encouraged. This collaboration would subsequently create a meaningful opportunity to thoroughly reflect to which extend a certain design actually facilitates or potentially undermines women's empowerment. At all times, it is of importance that the narrative of the autonomous, agent and self-competent women is emphasized within the design of period trackers. All-in-all granted that designers uphold this principle of intersectionality, the associated ethical drawbacks regarding the failure of the representation of different women; the rise of epistemic injustice and the reinforcement of harmful and conservative narratives concerning womanhood in period trackers can be minimized in the following ways.

First, the failure of the representation of different women is minimized by designers creating opportunities for shared-decision making with intersectionally diverse women in which they centralize their specific health preferences in the design process. Second, granted that designers pay careful attention to the selected imagery, rhetoric and choice architecture in their design meanwhile actively integrating the knowledge of women, the hazard of testimonial injustice can be alleviated. Finally, if designers prioritize the establishment of a balanced design team which predominantly consists of women and simultaneously engage with interdisciplinary experts to broaden their perception on womanhood, designers could reduce the risk of reinforcing potential detrimental and conservative notions of womanhood.

At all costs, it is of importance that designers maintain an intersectional outlook to prevent the sole empowerment of women who are heterosexual, cis-gendered, white, able-bodied, affluent and highly educated. Hence, by designers adopting an intersectional outlook in their design taking into account the different ‘intersections’ of women, they can create a more woman-centred rather than a ‘prototype’ centred type of period tracker. As a result, an increasingly number of women will be provided with a deeper sense of bodily knowledge, agency and thus empowerment. In the end one might say: “What’s a woman is a question that should remain open” (Almeida et al., 2020, p. 28). Additionally, within the design of period trackers, the openness of the concept ‘woman’ should be honoured as much as possible. As of now, we will turn to discuss how designers and the environment that they operate in can ensure reliable data management to avoid the exploitation of women’s intimate data.

3.2 Reliable data management

As mentioned before with the clear example of Flo and its prosecution due to selling women’s data, an important ethical drawback of period trackers is their potential to exploit the intimate data of women and thus undermining their empowerment. Women and their intimate data ought to be protected at all times in this FemTech industry. Although designers may have sincere intentions to make period trackers a feminist and empowering technology that contributes to closing the gender data gap, nonetheless they still operate within a capitalist economy (McMillan, 2022). That said, data and privacy remain of concern within most technologies. However, especially within the realm of period trackers, designers need to pay thorough attention to this matter to avoid that women are put at risk to become the ‘product’ (Hendl & Jansky, 2022; Kressbach, 2021; McMillan, 2022). Hence, this drawback thoroughly undermines the whole idea of women’s empowerment, since in this case, women and their most intimate self are put in a very dependent and vulnerable position in this day and age of big data. This idea conflicts with women’s empowerment, which is actually about women increasingly gaining control in the sense of gaining bodily knowledge but also experiencing agency over one’s data.

For this reason, designers need to navigate their way of building period trackers within the age of ‘big data’, and ought to be honest and sincere about their motives to make sure that period trackers indeed benefit to the empowerment of women. Moreover, in this paragraph it will equally be emphasized how it is not only the responsibility of designers to establish reliable data management but that they ought to be legally facilitated as well.

First, I propose that to avoid the exploitation of women's data, designers ought to seek and rely on other financial resources to make period trackers profitable instead. In that sense, they avoid that women become the 'product' by selling their data to third companies to facilitate profit. This can be established if designers decide to reach out to national health insurances¹² as a source of investment that would help them to provide reliable and medically oversighted period trackers. Additionally, the motivation for national health insurances to cooperate with designers could be because this investment can be seen as a valuable contribution to supporting women's wellbeing. Moreover, it could have the positive side-effect of simultaneously alleviating the workload for general practitioners as well because women become self-learning in terms of their menstrual and sexual health instead.

Second, I propose that designers ought to be transparent about their data usage and its policy to avoid the data exploitation of women. A successful example was illustrated by the establishment of the period tracker called "Drip"¹³. This period tracker is an initiative by the German feminist movement called the Bloody Health Collective. Although this period tracker is still in its infancy and is less lucrative, nonetheless this period tracker is a case example of an inclusive and morally sensitive technology that protects women and their intimate data. To illustrate, these designers use rhetoric in their period tracker such as: "Your data, your choice", "Everything you enter stays in your device" or, "Track what you like" (just your period or detect your fertility using the symptothermal method)¹⁴. Furthermore, they ensure that the data is only saved locally and not uploaded externally, that this app can be used anonymously, lacks advertisement or spyware and is an open-source platform. The fact that this period tracker is open-source means that users can look into and modify their data collected by Drip¹⁵. Hence, these designers emphasize the transparency of their data usage and let their users decide what their preferred data storage looks like meanwhile respecting the privacy of women. As a result, this collective actually does justice to the idea of women's empowerment by this morally sensitive design.

Subsequently, this successful example of Drip can function as an inspiration for other period trackers and their designers as well. This case-example illustrates that period trackers can

¹² Although we do need to make sure that national health insurances do not have access to the intimate data collected by period trackers as to avoid discrimination in healthcare access between women

¹³ The privacy policy of the period tracker "Drip". Obtained from: <https://dripapp.org/privacy-policy.html>, Accessed at: 05-02-2024.

indeed enable women to cultivate their ‘power-from-within’ by using this device to their own preferences and not become the product instead. However, one objection that can be made against this proposal is that although this period tracker is ideologically speaking morally sensitive, it nonetheless fails to be lucrative and is only used by women on a small scale. For this reason, the actual influence on women’s empowerment by women using Drip remains marginal. Nevertheless, this scenario illustrates that designers ought to create a period tracker that not only empowers women but also ensures financial viability. To establish this, designers ought to prioritize a business model that aligns with the ideological goal of centralizing women’s empowerment meanwhile also seeking financial partnerships such as with national health insurances as emphasized before in order to guarantee financial profitability.

Third, I propose that designers ought to be facilitated in establishing a reliable and secure data management by adaptations that need to be made to the General Data Protection Regulation (GDPR). In other words, it all falls or stands with the legal framework that designers operate in. As of now, the GDPR safeguards and regulates personal data that adheres to health, sex-life and sexual orientation. However, there is no existing policy formulated on how fertility data ought to be treated (McMillan, 2022). This is severely problematic since this is exactly the kind of data that is being collected by period trackers. It is too simplistic to assign fertility data to the categories of ‘health’ or ‘sex-life’. Fertility data concerns a very personal and specific form of data and hence the GDPR needs to integrate fertility data in their privacy statement as well. This ought to be the case to safeguard the privacy of women using period trackers, and to ensure that at all times women stay in charge over their own data and hence exploitation is avoided. That said, when designers indeed are facilitated to operate within a legal framework that prioritizes the protection of fertility data, women and their data would not be commercialized and exploited instead.

As suggested, if these aforementioned suggestions are given a seat at the table, period trackers could be equipped with a morally sensitive data framework that actually contributes to women being in charge over their own data. This could indeed make the usage of period trackers a justifiable means to establish women’s empowerment. This is the case since the most intimate data is safeguarded in a transparent, safe, autonomous and sincere manner. Consequently, women remain autonomous and can take personal ownership over both their data and their own health. As of now, we will turn to the last solution, which involves designers fostering their moral competence in order to build an inclusive and morally sensitive period tracker design.

3.3 Cultivation of moral competence

Often, designers are perceived as actors who make decisions in a rational and objective manner when designing technologies. However, as technology ethicist Roeser (2012) stresses, designing technologies is never a neutral endeavour and is by definition a normative activity. This accounts for the creation of period trackers as well. As mentioned before, norms and values of individuals are embedded within the technology that designers create. This equally accounts for period trackers, designers ought to be aware what kind of norms and values they embed in their design granted that women's empowerment is the ultimate goal.

Subsequently, the cultivation of moral competence by designers is of utmost importance to create an inclusive and morally sensitive period tracker that hence contributes to women's empowerment. Moral competence is defined by Roeser (2012) as the idea that engineers ought to be morally sensitive to reflect on the ethical implications of their work and are simultaneously equipped with well-developed emotional capacities such as empathy and sympathy. This ought to be the case to make design choices which are considered morally permissible. Thus, if designers are aware of the moral implications of their design, they can partly exert influence which moral values are reflected, supported or neglected in their technology design as well (Jacobs & Evers, 2019; Jasanoff, 2016). Similarly, applied to the design of inclusive and morally sensitive period trackers, this necessitates that engineers are equipped with an appropriate moral compass to design in such a manner that their design actually supports values which are known for contributing to women's empowerment.

That being the case, how can the aforementioned ethical drawback concerning the failure of representing diverse kinds of women be mitigated? As mentioned earlier on, the lack of moral competence within designers is demonstrated by the fact that contemporary and popular period trackers solely appeal to heterosexual, cis-gendered, white, affluent, able-bodied and regular menstrual cycled women. Hence, this illustrates that the designers of these period trackers did not broaden their design options by putting themselves into the shoes of different women. In other words, they have failed to engage and empathize with the needs and preferences of intersectionally different women. This asks for moral awareness on the hand of designers.

In response, I propose that designers engage in profound emotional-ethical reflection. This entails that designers ought to envision different period tracker designs and how these designs would consequently impact different women. However, this empathetic approach requires of designers to really engage with these women using period trackers. Concretely speaking, a very practical framework that could help designers discover which values are important or are simultaneously at stake in their design, is known as the approach of Value Sensitive Design (VSD). This is the case since VSD secures the integration of core human values (Friedman & Hendry, 2019). VSD is explained as a method that illustrates “what is important to people in their lives, with a focus on ethics and morality” (Friedman & Hendry, 2019, p. 4). That said, this theory embeds considerations in the conceptual, empirical and technical sphere. As of now, VSD is already used within persuasive technologies, human-robot interactions and other engineering design practices (Friedman & Hendry, 2019). Applied to period trackers, VSD could contribute to building a technology that actually benefits women’s empowerment in which the design aligns with values such as inclusivity, intersectionality, privacy, justice and autonomy. Similarly, these aforementioned values are highly associated with women’s empowerment as well.

Now, practical tools that follow from a VSD approach concern stakeholder analysis, imagining value scenarios and mapping out multi-lifespan timelines (Friedman & Hendry, 2019). This could entail that designers ought to conduct a thorough stakeholder analysis in order to explore what the concrete motives are of actors investing in a period tracker and by simultaneously making their hidden agendas visible. In that manner, it can be analysed to which extend designers pursue profit, or that their agenda is more ideologically driven. Additionally, designers ought to imagine different value scenarios by engaging with the lived experiences of intersectionally diverse women. To illustrate, designers might ask a question such as: What kind of values would you like to see reflected within the period tracker to support your journey to better understanding your bodily health? Furthermore, in analysing a multi lifespan study, designers ought to scrutinize how the health needs of different women change over time when using a period tracker. For instance, currently, many women using a period tracker value the experience of gaining bodily knowledge so that they can experience bodily awareness and hence feel a sense of agency (Boldi et al., 2024). However, this main focus of women who want to gain bodily knowledge might change over time. This is the case because ideas about health are equally dependent upon the normative beliefs that we hold in society.

All-in-all, this paragraph demonstrated that designers who are well-equipped in cultivating moral competence can put themselves more easily in the shoes of other women.

Consequently, they can be more responsive to the needs of intersectionally diverse women, and they can create a period tracker that actually attunes with the desired values and health needs of these women. It is for this reason that awareness concerning the moral competences of designers ought to be scrutinized to establish a design that eventually contributes to women's empowerment.

Second, the former mentioned problem of the potential perpetuation of harmful and conservative narratives about womanhood is a realistic danger as well. Biases concerning womanhood can either manifest themselves in designers consciously or subconsciously. However, moral awareness concerning these biases is of utmost importance because they permeate the design of period trackers as well.

For this reason, I propose that special attention is given to the process of data gathering. As mentioned before, data gathering is an important process that can be permeated with biases (McMillan, 2022). That being the case, designers ought to be aware of their own convictions concerning womanhood. In that sense, it is of importance that designers are trained to see how they can gather intersectionally diverse data as a fundament for sensible period tracker design. Hence, they need to actively reflect on their design motives, normative opinions, intentions and biases in establishing period trackers grounded within the idea of empowerment.

As a result, by making the subconscious conscious, designers can actively design period trackers that are not deterministically shaped by narrow-minded convictions. To make a morally sensible and inclusive period tracker, designers need to gain a diverse and critical perspective on what it means to be a woman in this day and age. This necessitates that designers have a comprehensive understanding of both the historical and modern perspectives on the treatment of the female body in the medical context. Hence, they can better envision how perceptions of womanhood are interpreted within the technical landscape and how notions that resonate with empowerment ought to be integrated within their design.

Consequently, the comprehensive understanding of designers about notions of womanhood strengthens their moral competence. Furthermore, the underlying algorithms that subsequently interpretate the gathered data of period trackers ought to be critically scrutinized as well. As a result, designers can decide whether these algorithms actually support values such as inclusivity, intersectionality, autonomy, justice and subjectivity of experience.

In brief, a morally competent period tracker designer prevents the contribution to harmful narratives about womanhood and instead pursues to establish a period tracker that is free from stigma and harm by promoting values such as diversity, inclusivity, justice, autonomy and thereby empowerment for women.

Third, in order to prevent the exploitation of women's intimate data by commodifying women and their worth and hence undermining their empowerment, designers ought to actively engage in training their moral awareness concerning the value of privacy as well. As mentioned before, an example of a lack of moral competence follows from the event that happened with period tracker Flo, in which the selling of millions of women's data to third parties became common practice. This example illustrates how in the moral trade off between different values, the designers of Flo did not prioritize the privacy of its users. Put more strongly, they chose the value of financial profit as more important instead.

For this reason, I propose that designers ought to engage in becoming skilled in navigating difficult moral trade-offs. Moral trade-offs are ethical situations that are characterized by choosing between conflicting values (Friedman & Hendry, 2019, pp. 44–45). To illustrate, a concrete example in the design of period trackers is the value of financial profit versus the value of safeguarding users' privacy. At all times, to mitigate the exploitation of women's data, designers ought to prioritize and respect the privacy of women by making it a central value that needs to be embedded in their period tracker design. Consequently, women and their data remain transparent and safe which results in women remaining autonomous and in charge over their own intimate data. Hence, their empowerment would not be undermined.

In sum, in this chapter, it was argued that designers of period trackers and the legal framework that they operate in ought to change. That said, the potential harm of the associated ethical drawbacks potentially undermining women's empowerment through the usage of period trackers can be minimized. Hence, in this chapter it was argued that designers need to: i) adopt an intersectional perspective, ii) need to be facilitated in upholding a legal framework that prioritizes reliable data management, iii) foster moral competence to ensure an inclusive and morally sensitive period tracker design. As of now, we will turn to the conclusion in which a brief summary of the mentioned arguments is provided as to why the usage of period trackers can indeed be seen as an ethically justified means to promote women's empowerment.

Conclusion

This thesis has occupied itself with the question if the usage of period trackers by women are an ethically justified way to empower women. It was argued that period trackers create possibilities for empowerment, and that it is possible for period tracker designers to create an inclusive and morally sensitive period tracker that enhances women's empowerment.

Hence, in chapter 1, it was argued that due to several reasons the usage of period trackers is indeed an ethically justified way to improve women's empowerment. First, it provides women with tools for self-care. Second, their usage contributes to both inclusive and equal healthcare access for women. Third, they contribute to diminishing stigma regarding women's menstrual and sexual health. Fourth, they enhance the socio-economic position of women by inspiring other women to pursue a career within the STEM-field. Hence, these arguments demonstrated why the usage of period trackers for the purpose of women's empowerment is indeed justifiable.

Subsequently, in chapter 2, it was argued that although bearing in mind the prospects of period trackers as a means to empowerment, nonetheless this technology might fall short. This is the case since period trackers might fail to represent intersectionally diverse women, might contribute to women experiencing epistemic injustice, might perpetuate harmful and stereotypical assumptions about womanhood and finally by exploiting women's data in which they become the 'product' instead.

Finally, in chapter 3, a threefold solution was proposed as a response to the aforementioned ethical drawbacks associated with the potential disempowerment of period trackers. It was argued that to minimize the risk of women's disempowerment, designers: i) ought to adopt an intersectional perspective, ii) should be legally facilitated in establishing reliable data management, iii) should foster their moral competency. That being said, if these latter suggestions are taken to heart, period trackers and their usage can indeed be perceived as an ethically justified tool to attain women's empowerment. In that sense, women would increasingly gain a deeper sense of bodily knowledge and are well-equipped to take ownership over not only their menstrual health, but for their wellbeing in general.

However, this thesis also contains certain limitations. For instance, it should be mentioned that this thesis did not address that for an eventual successful implementation of period trackers that contribute to women's empowerment, it is of importance to critically scrutinize and challenge the medical landscape as well. As previously mentioned, the healthcare sector

and its policy and underlying assumptions are predominantly male-oriented. Hence, eventually, this asks for a profound paradigm shift in the medical landscape as well. This would involve a shift towards a more feminist and woman-centred approach in healthcare. Thus, it is eventually not enough to solely burden period tracker designers with the responsibility to create inclusive and morally sensitive design if they keep operating in an environment that might be undermining important values such as intersectionality, inclusiveness and diversity for women.

Furthermore, suggestions for future research can be made. First, it might be useful to examine how the digital literacy of women can be enhanced. This entails that women need to be informed and educated on how they can become more digitally resilient and acquire digital literacy to estimate the risks of the potential exploitation of their most intimate data. In that way, women can make morally sensible choices when it comes to choosing the right period tracker that actually does have a reliable data strategy and actually empowers them in a way that it respects their privacy and corresponds with their values. To illustrate, women could learn how period trackers use their data, use encryption and guarantee data privacy. Therefore, this underscores the personal responsibility of women in discerning what to consider when selecting a period tracker that aligns with their values.

Second, further research can be done by analysing the controversiality regarding the medical reliability of period trackers. As mentioned earlier on, the usage of period trackers remains a controversial topic that is associated with actually undermining women's empowerment due to the lack of providing medically reliable information. That said, this thesis did not mean to advocate for period trackers being a watertight technology to rely on for women in preventing conception. Rather, this thesis aimed to illustrate how besides preventing conception, women can use this technology as a tool to enhance their empowerment. This was illustrated by demonstrating how period trackers help women to increasingly gain knowledge about not only their menstrual health but their wellbeing in general. That said, in an era where women are increasingly taking charge over their health, incrementally, with the usage of inclusive and morally sensitive period trackers, more women would feel like their health would be prioritized. Moreover, they would gradually feel that their stories are being heard, valued and celebrated. All-in-all, this marks one step forward towards achieving empowerment for each and every woman.

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