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**In_equalities, digitized: practices, experiences and consequences of
app-supported menstrual tracking**

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1 INTRODUCTION

The cyclical nature of menstruation has played a major role in the development of counting, mathematics, and the measuring of time... Lunar markings found on prehistoric bone fragments show how early women marked their cycles and thus began to mark time. Women were possibly "the first observers of the basic periodicity of nature, the periodicity upon which all later scientific observations were made". (Zaslavsky, 1992, citing Thompson, 1981)

Mobile applications for tracking of menstrual cycles (called menstrual apps or period apps hereafter) represent a subgroup of health apps and thus form part of one of the most dynamic developments in the areas of biomedicine and healthcare in recent years (Research2Guidance, 2017). Menstrual apps are software programs that support the observation and analysis of menstruation and associated physiological, emotional and behavioural factors including monitoring of menstrual dates, pain, intake of medication and contraceptives, sex life, and observation of emotions, vaginal discharge, weight, food cravings and sleeping patterns. Based upon the data entered by users, the apps

calculate average menstrual cycle lengths and predict future period and ovulation dates as well as upcoming symptoms. Further, some of these apps provide users with medical information via links and pop-up windows, offer fora to connect with other users, and a sharing function to forward menstrual data to healthcare professionals and intimate partners or friends.

The present doctoral dissertation draws upon a qualitative interview study performed with period app users in Austria and Spain, as well as an autoethnography carried out using several menstrual apps myself. The main objective is to examine users' practices and experiences of app-supported menstrual tracking and to explore the consequences on gender and other sociocultural inequalities.

As highlighted by Zaslavsky's (1992) quotation, the observation and analysis of menstrual cycles is likely to have played a crucial role in the development of counting and mathematics. Also when tracking menstrual cycles via apps numbers are pivotal. In order to facilitate the tracking of periods and associated symptoms, menstrual apps build upon processes of quantification, i.e. the translation of users' observations and experiences into numbers. During app-supported menstrual tracking, qualities are transformed into quantities as specific

sensations and experiences are abstracted into seemingly objective values. Although numbers have been shown to serve as a universal language with the ability to cross boundaries and overcome differences (Espeland & Stevens, 2008), quantification comes at a price as complex experiences are simplified, specificities are obscured, and differences are made equal (Sherman, 2016). The present thesis aims to visibilise the complexities and specificities of app-supported menstrual tracking and to shed light on the impacts of digitized self-tracking on the stabilization and questioning of gender, health and other sociocultural in_equalities.

1.1 Structure

The present thesis comprises 7 main chapters and follows the traditional layout of a dissertation. Following the introduction, I provide a literature overview on related studies with a focus on those examining practices and consequences of menstrual tracking and self-observation of health. Further, I also present the most relevant empirical and theoretical contributions from a variety of scholarly fields including Critical Data Studies, Digital Media Studies, and (feminist) Science and Technology Studies, as well as literature on the medicalisation of menstruation, and recent studies drawing upon affect and embodiment theories. Then, the aims and research questions are presented, followed by a description of the methods. The results chapter builds upon extracts from the user interviews as well as the autoethnography. The chapter is divided into five parts examining the five major themes of this dissertation. The first part provides an overview of the contexts, processes, reasons and practices of app-supported menstrual tracking. The second part explores shifts in the medicalisation of users' bodies and menses through the use of apps for period tracking. It focuses on three aspects: app-supported menstrual tracking as a means to control periods and bodies, shifts in the interaction with healthcare

professionals, and app-supported menstrual tracking as a mode of health tracking. The third part reports on changes in the understanding and experience of menses and bodies resulting from the shift from analogue to digitized forms of self-tracking. Further, I explore the connections that are being established between users, apps, and the data they generate. The fourth part focuses on menstrual app users' impressions as well as strategies and affects regarding issues of privacy and surveillance. The fifth part explores users' experiences of and responses to gendered period app design. The discussion chapter contrasts the results with the literature presented in the review. The conclusion provides a short overview of the dissertation's main contributions and points out suggestions for future health app development. Supplementary materials such as interview guidelines can be found in the annex section following the bibliography.

2 BACKGROUND AND LITERATURE REVIEW

The present chapter provides a detailed description of menstrual apps and an overview of the most relevant literature regarding menstruation as well as an extensive account of studies on (menstrual) self-tracking. Further, I present empirical and theoretical contributions examining the medicalisation of menstruation, publications from (feminist) Science and Technology Studies, as well as literature from the fields of Critical Data Studies and Digital Media Studies drawing predominantly upon affect and embodiment theories. The literature presented here is extensive but not exhaustive as I have focused predominantly on recent contributions in English language.

2.1 Menstruation

Menstruation is understood as one of the most important biological differences between men and women (Society for Menstrual Cycle Research, 2011). Commonly linked to reproduction and heterosexuality, menstruation is often understood as a failed production process. For instance, the patient care and health information webpage of one of the major US clinics defines menstruation as follows:

“The menstrual cycle is the monthly series of changes a woman's body

goes through in preparation for the possibility of pregnancy. Each month, one of the ovaries releases an egg — a process called ovulation. At the same time, hormonal changes prepare the uterus for pregnancy. If ovulation takes place and the egg isn't fertilized, the lining of the uterus sheds through the vagina. This is a menstrual period.” (Mayo Clinic, n.d.)

As highlighted by socio-scientific studies, menstruation is not only a physiological process but always also a sociocultural construction, and experiences of menstruation and associated symptoms vary significantly (Newton, 2016). Anthropological accounts have shown that there exists a variety of cultural practices, beliefs and representations surrounding menstruation (Knight, 1987; Mead, 1949), whereas negative attitudes seem to prevail in many places and over historical eras (Newton, 2016). Menstruating women are often perceived as polluted and polluting, and period blood is frequently understood as dangerous and a sign for women’s inherent sinfulness. The arguably oldest written account propagating the polluting and contagious nature of menstruation can be found in the Old Testament’s Book of Leviticus (Delaney, Janice; Lupton, Mary Jane; Toth, 1988):

“Whenever a woman has her menstrual period, she will be ceremonially unclean for seven days. Anyone who touches her during that time will be unclean until evening. Anything on which the woman lies

or sits during the time of her period will be unclean. If any of you touch her bed, you must wash your clothes and bathe yourself in water, and you will remain unclean until evening. If you touch any object she has sat on, you must wash your clothes and bathe yourself in water, and you will remain unclean until evening. This includes her bed or any other object she has sat on; you will be unclean until evening if you touch it. If a man has sexual intercourse with her and her blood touches him, her menstrual impurity will be transmitted to him. He will remain unclean for seven days, and any bed on which he lies will be unclean.” (Leviticus 15: 19- 24)

Further, the conceptualization of menstruation as painful and a form of punishment for Eve’s Original Sin is believed to result from its association with negative depictions of childbirth in the biblical Book of Genesis (Fingerson, 2006; Newton, 2016).

Periods are also a recurring theme in fairy tales such as Little Red Riding Hood portraying menarche (beginning of menstruation) and associated dangers (Bettelheim, 1976). Menstruation is also taken up in movies and popular contemporary novels. Examples are the “period blood on the leg scene” in the 2007 comedy film “Superbad” where the main character reacts with disgust when noticing a period blood stain on his leg after dancing with a girl at a party, or Steven King’s novel

“Carrie” (1974) representing the period as both, an embarrassing as well as powerful event. In advertising, menstruation is often depicted as something that requires concealment and limits physical as well as social activity, and in marketing of drugs for menstrual discomfort periods are commonly presented as a “hygienic crisis” (Noel & Brumberg, 2000). The negative image of menstruation has been conceptualized as “menstrual taboo”, shaping many religious and secular practices (Knight, 1987).

Until today, there are many myths and misconceptions surrounding menstruation. For instance, a survey carried out with Austrian adolescents revealed striking knowledge gaps and widespread negative perceptions of periods and related symptoms (Erdbeerwoche, 2017). As reported by the authors, 17% of the girls and 34% of the boys could not define menstruation. Further, 60% of the girls stated to perceive periods as negative and 70% of the boys said that menstruation was either unimportant or embarrassing. In Spain, Europe’s first menstrual education community has been founded and the growing number of members indicates the need for spaces of menstrual education and exchange (Irusta, n.d.). In a study on adolescents’ experiences of menstruation, Fingerson (2006) finds that periods are often presented

to teens within a medicalized context. Biomedical conceptions of menstruation are among the most influential forces shaping the experience and understanding of menstruation. The medicalisation of menstruation will be discussed in more detail below.

Understanding menses not merely as a biological process but also as a sociocultural construction opens up the possibility to actively engage in the shaping of its perception and experience. As highlighted by Bobel (2006), menstrual health activism started in the 1970's and 1980's as a part of the women's health movement. Through the formation of self-help groups, the foundation of feminist clinics, and the dissemination of information material, feminists aimed at empowering women and giving them greater control over their bodies. Many of the issues addressed at the time have been taken up by contemporary menstrual activism. Examples for recent activist approaches are the formation of menstrual education communities such as the Spanish platform "El Camino Rubi", the struggle against the "tampon tax", highlighting that tampons and other menstrual products are subject to value-added tax, or the sharing of menstrual experiences on social media. From the perspective of Queer Studies and with the aim of challenging standard sex/ gender binaries, the term "menstruator" has been coined (Newton,

2016: 50). As noted by Bobel (2006), the detachment of menstruation from the category “women” challenges essentialist assumptions while taking the body seriously.

2.2 Menstrual apps

Health-related mobile applications (health apps) are software programs that run on smartphones or other portable devices such as tablets and support the collection, observation and analysis of health-related information. Health apps address a broad audience including healthcare providers, medical students, patients, and the general public (Kamel Boulos, Brewer, Karimkhani, Buller, & Dellavalle, 2014). Given their variety, they can be used for a wide range of purposes including the seeking of biomedical information, monitoring of (chronic) diseases, and supporting the achievement of fitness goals. With more than 325.000 health apps available in the app stores in 2017, they represent one of the most dynamic and rapidly growing technological inventions in the areas of biomedicine and health care (Research2Guidance, 2017). Mobile applications for tracking of menstrual cycles (menstrual apps or period apps) represent a subgroup of health apps and allow for the observation and analysis of menstruation and associated factors. Most menstrual apps offer four principal functions. First, and most commonly presented on their home screen, menstrual apps display a numerical countdown indicating the number of days left until the start of the next period or fertile phase. Several period apps also show

graphic illustrations presenting an overview of the different phases of the menstrual cycle, sometimes also displaying related symptoms such as premenstrual symptom (PMS). On the same screen, the majority of apps provide a button users can tap when their period has started or stopped (figure 1).



Figure 1 Home screens of Clue (left), Period Tracker (middle), My Calendar (right)

Second, menstrual apps offer a variety of tracking categories including physical and mental parameters as well as behavioral aspects related to menstruation. Among the most prominent factors that can be recorded are pain and pain management, intake of medication and use of contraceptives, sex life, emotions, vaginal discharge, weight, exercise, food cravings and sleeping patterns. Third, period apps provide users with a menstrual calendar showing past, current and future menstrual

dates. Often, ovulation and fertile days are shown as well and days on which symptoms have been recorded are highlighted in specific ways. Fourth, and based upon the data entered by users, period apps provide an analysis screen with graphs, tables or numerical illustrations of statistical data on average cycle lengths and ir/regularities as well as shifts in menstrual cycle-related symptoms such as weight gain, mood swings and temperature curves (figure 2). Further, a number of menstrual apps provide users with medical information via links and pop-up windows, offer fora to connect with other users, and a sharing function to forward menstrual data to healthcare professionals and intimate partners.

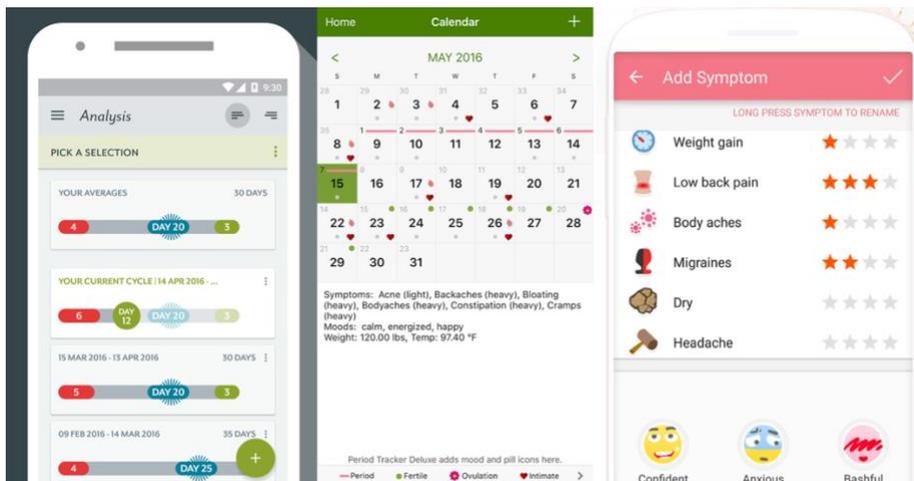


Figure 2: Screen shots of cycle length analysis (Clue), calendar view (Period Tracker)

2.3 Menstrual tracking

Self-tracking is not a novel development but builds upon a long history. As pointed out by Rettberg (2016) in her book on the role of digital technologies in self-representation, the first written accounts of the self date back to autobiographies recorded over 2000 years ago and aimed at spiritual and religious self-examination and improvement. Today, digital media such as mobile applications (apps) enable novel modes of self-tracking albeit with similar objectives. Monitoring of menstruation and associated factors via apps represents one type of health-related self-tracking. Just as valid for other forms of digitized self-examination, app-supported tracking of menstrual cycles is not a novel development but follows a long tradition of non-digital ways of observation and analysis of menstrual cycles. In fact, monitoring of menstrual cycles might represent one of the first practices of self-observation in human history: although its purpose remains disputed, some scholars argue that the Ishango bone was used as an instrument to track menstrual cycles and lunar phases over 20.000 years ago (Zaslavsky, 1979). More recent artefacts for cycle-tracking include paper calendars, cycle calculation

and conception discs, birth control chains and first computerized personal fertility advisors¹ (see figure 3).



Figure 3: IVF Calculation Disk, Birth Control Chain, Cycle Computer (from left to right), MUVS, Vienna

Period apps are among the latest developments to observe and analyse menstrual cycles. In recent years, they have become increasingly popular: in 2016, the download volume for menstrual apps has been estimated to comprise 200 million (Dreaper, 2016), and tracking of

¹ For an impression of devices for menstrual tracking, visit the webpage of the Museum for Contraception and Abortion: <http://en.muvs.org>

menstruations via apps is recommended by healthcare professionals such as the American College of Obstetricians and Gynecologists:

“Asking the patient to chart her menses may be beneficial, especially if her menstrual history is too vague or considered to be inaccurate. The importance of accurate charting should be emphasized and the patient should be educated about what would be considered an abnormal menstrual cycle. Clinicians should explain that cycle length is counted from the first day of a menstrual period to the first day of the next menses and may vary by cycle because this often leads to miscommunication between patients and clinicians. Use of technology can facilitate charting; there are a number of easy to use smart phones applications designed for this purpose.”
(The American College of Obstetricians and Gynecologists, 2015)

In contrast to their increasing popularity, the overall scholarly attention to menstrual tracking via apps remains limited². Among the existing research, the majority of the publications I could identify from the biomedical area either focus on menstrual apps per se or make use of app-recorded data with the aim of gaining further insights into menstrual health and improvement of app design. This includes studies evaluating period apps’ design and performance: for instance, there are

² The literature review includes publications on fertility-tracking apps and apps for pregnancy and young motherhood as they share important functions and aspects with apps for menstrual tracking.

two studies focusing on menstrual apps' prediction accuracy regarding ovulatory dates concluding that most apps are inaccurate and thus not appropriate for preventing pregnancy (Duane, Contreras, Jensen, & White, 2016; Johnson, Marriott, & Zinaman, 2018). Further, a paper evaluating menstrual apps' accuracy, features and functionality finds that most apps are inaccurate, fail to refer to medical literature and do not involve healthcare providers' expertise (Moglia, Nguyen, Chyjek, Chen, & Castaño, 2016). There is one study that processes menstrual and ovulation data recorded by an app in order to know more about the timing of ovulation and to improve the accuracy of menstrual apps (Sohda, Suzuki, & Igari, 2017). Moreover, another publication reports on patient satisfaction and compliance when using an app for charting of heavy menstrual bleeding (Jacobson, Vesely, Haamid, Christian-Rancy, & O'Brien, 2018).

Most publications from the field of computer science focus on user experience and menstrual app design. I have published a short paper on users' perceptions of and responses to gendered menstrual app design (Levy, 2018). Bretschneider (2015) reports on the development of a period app prototype with an adaptive user interface. The author highlights the importance of taking users' motivations and contexts into

account. Among other suggestions, Bretschneider argues that period apps should provide users with the option to relate the tracked data to the respective cycle phase and to compare different cycles and cycle phases. Moreover, Epstein et al. (2017) presented a study reporting on practices of menstrual tracking in the US context. Based upon data collected via a mixed-methods approach, the authors explore women's reasons for and practices of tracking their menstrual cycles. The paper does not exclusively focus on apps but reports on a variety of other tracking practices: the use of digital calendars, writing of paper diaries, following cues in their birth control, attentiveness to symptoms and remembering. Epstein and colleagues highlight five principal reasons why women track their cycles: to increase their bodily awareness, to better understand bodies and menstrual cycles, to prepare for menstruation, seeking pregnancy, and to inform communications with healthcare providers. Based upon their findings, the authors present several suggestions for the improvement of menstrual app design: improvement of prediction accuracy, gender-neutral and discrete design, possibility to reconfigure menstrual apps according to users' needs, and support regarding patient-doctor interactions.

From the perspective of the social sciences, there is one study on period apps stating similar reasons why women track their menstrual cycles: in order to keep track of and predict menstruation dates, observe menstrual symptoms, improve the communication with healthcare providers, and with the aim of fertility tracking either to plan or prevent pregnancies (Rubinsky, V., Cooke-Jackson, A., Gunning, J. N., & Bartson, 2018). Further, employing a mixed methods approach and predominantly including users from the UK, Ireland and the US, Gambier-Ross and colleagues (2018) have examined women's uses of and relationships with fertility-tracking apps. Given the study's focus, the principal reasons for app use highlighted by the participants revolve around fertility tracking: seeking pregnancy, support fertility treatment, and contraception. However, some users also mentioned other reasons such as cycle observation, preparation of periods and tracking of hormonal mood swings. Together with Nuria Romo-Avilés, I have published a paper on the main characteristics of app-supported menstrual tracking (Levy & Romo-Avilés, 2019). The publication reports on eight aspects: 1) tracking menstrual cycle dates and regularities, 2) preparing for upcoming periods, 3) getting to know menstrual cycles and bodies, 4) verifying menstrual experiences and

sensations, 5) informing healthcare professionals, 6) tracking health, 7) contraception and seeking pregnancy, and 8) changes in tracking. We conclude that period tracking via apps can be empowering as well as have negative consequences for users. The paper also presents practical implications for healthcare providers and app developers.

There are studies on digital media use during pregnancy and early parenthood that include menstrual or fertility tracking apps in their analyses: drawing on data gathered from an online survey with pregnant or formerly pregnant Australian women, Lupton and Pedersen (2016) highlight the widespread use of apps to support pregnancies and early parenthood and list users' motivations: seeking information, monitoring own and foetal bodies, and provision of reassurance. In a focus group study, Lupton (2016c) reports on users' reasons and expectations driving digital media use, finding that pregnancy and early motherhood apps as well as websites do not only serve as tools for information provision but also play a role in the maintenance and establishment of social relationships. The same author also published an analysis of apps for self-tracking of sexual and reproductive activities and functions (Lupton, 2015). Lupton focuses on the apps' role in processes of surveillance and self-responsibility, highlights how

sexual and reproductive apps foster gender stereotypes and norms associated with reproduction, and participate in the disciplining of bodies.

An earlier article by Lupton (2013) examines the consequences of mobile health technologies in general. The author finds that these technologies promote techno-utopian, enhancement and healthist discourses by privileging the visual and metric in representing the body. Further, there are several other important studies focusing on the sociocultural, ethical and political implications of health tracking that will be presented in the following subchapters.

2.4 Medicalisation of menstruation

In simple terms, medicalisation can be described as the process through which aspects of life become defined and treated as medical problems (Conrad, 2007). Although the history of medicalisation can be traced back to the 17th century, medicalisation as a socio-scientific term is relatively young as it dates back to the mid- to later 20th century (Bell & Figert, 2010). Within this short period of time, the concept of medicalisation has been subject to continuous changes and its initial understanding as a top-down process involving control, medical imperialism, surveillance and rational application has been replaced by models that pay attention to its complexity and contestability (A. Bell, 2010). For instance, while most of the socio-scientific work on medicalisation has focused on women's bodies, more recent and often feminist scholarship has adopted intersectional approaches and included men's as well as intersex and trans people's bodies (S. E. Bell & Figert, 2010).

Menstruation and related symptoms have received significant medical attention from the beginnings of Western medicine in Ancient Greece. As evident from the Hippocraticum, a collection of medical works that date back to the 5th and 4th century BCE, menstruation has been

associated with reproduction and general health from early on (Newton, 2016). Aristotle understood menstruation as a bodily manifestation of women's inferiority and underscored the importance of regular menstrual bleeding for women's general health. Although these early medical writings on menstruation often mirrored and reinforced women's subordinate social position at the time, there are also documents in which menstruation was conceptualized as a sign for women's (destructive) power, attributing venomousness as well as curative properties to menstrual blood. In the early modern period, advances in the medical sciences led to a better understanding of reproduction and the questioning of menstruation's negative image. The physiological processes involved in menstruation were understood in their entirety only in the mid-twentieth century (Shuttle and Redgrove 2005 in Newton, 2016).

In contrast to the medical attention menstruation has received in Western medicine from early on, its medicalisation took place only in the end of the 19th century. At that time, treatment and definition of menstruation was put in the hands of male medical experts and menarche (the beginning of menstruation) was turned into a health and hygiene issue (Brumberg 1997 in C Bobel, 2010). Menstruation was

further medicalized in 1931, when premenstrual syndrome (PMS) was first described (Newton, 2016). Another important step in the medicalisation of periods and menstruating bodies was the introduction of the contraceptive pill in the 1960s. While granting greater reproductive freedom and control over their bodies to women, the pill also strengthened associations between menstruation and reproduction and fostered the understanding of contraception and reproduction as in need for intervention by healthcare experts (Mamo & Fosket, 2009). In this context, hormonal contraceptives have been conceptualized as Foucauldian technologies of bodily governance (Newton, 2016). Today, a plethora of symptoms and conditions are being related to menstruation, differentiating “deviant” cycles from “normal” ones and depicting menstrual cycles as problematic not only on an individual but also on a societal level. Among the illnesses associated with menstruation are premenstrual syndrome (PMS), amenorrhea (absence of periods), menorrhagia (heavy menstrual bleeding), dysmenorrhea (painful periods) and PMDD (premenstrual dysphoric disorder). The latter represents the latest diagnosis related to menstrual cycles (Bobel, 2010). Further, through the relatively recent introduction of cycle-

stopping contraception such as “Seasonale”, menstruation itself is being constructed as problematic (Mamo & Fosket, 2009).

If one looks at the history of the medicalisation of menstruation and takes into account the broader political and sociocultural context, it becomes evident that menstruation does not represent an exclusively physiological process but is always also a social construction. Given its association with womanhood and reproduction, menstrual cycles and related symptoms “become[s] a matter of gender relations.” (Newton, 2016: 44). Hence, the medicalisation of menstruation was not met without any resistance. Historically, it was in the late 19th century - at the time menstruation became symbolic of women themselves - when periods gained importance in women's emancipatory struggles (Vostral, 2008). The growing medicalisation of menstruation in the 20th century led to the formation of feminist health movements which stressed the male bias in the medical system and accused the medical system of depriving women of control over their health and bodies (Bobel, 2010; Bransen, 1992).

From the academic and predominantly feminist perspective, important studies on the representations and understandings of menstruation in connection to gender relations have been carried out. Working in the

1920s, Margaret Mead was the first academic to question the negative image of menstruation and to include women's accounts in her research on periods (Newton, 2016). Emily Martin (1987) has demonstrated how the menstruating body has been conceptualized "out of control" and as a failed production in the context of the industrial revolution. And more recently, it has been shown that the biomedical construction of PMS perpetuates associations between reproduction and negative emotionality thus reinforcing women's inferiority (Markens 1995 in Newton, 2016). As underscored by Louise Lander (1988), emotions expressed during PMS such as anger and aggression are not consistent with societal expectations of women. In recent years, as mentioned above, discourses questioning gender /sex binaries have entered socio-scientific scholarship on menstruation as well as menstrual activism. Acknowledging that "not all 'women' bleed, and not all 'menstruators' are women" (Newton, 2016: 50), scholars and activists have demonstrated that menstruation can be conceptualized independently from the essentialist category "women" while taking the body seriously (Bobel, 2010).

As evident here, medicalisation is subject to continuous change and contestation. In the last few decades, scholars have identified major

shifts in the processes of medicalisation, predominantly driven by economic transformations and novel technoscientific developments. In 2005, Conrad identified three “engines of medicalisation” that induce changes in medical knowledge and organization: biotechnology, consumers and managed care (Conrad, 2005: 3). Around the same time, Clarke and colleagues (Clarke, Shim, Mamo, Fosket, & Fishman, 2003) coin the term “biomedicalisation” to highlight a major transformation of the medicalisation of bodies and identities mainly driven by technoscientific developments.

Menstrual apps are among the most recent technoscientific inventions in the management of menstrual cycles and associated symptoms and thus represent an interesting case for the examination of changes in the medicalisation of menstruation. Although I could not identify any scientific publication focusing on menstrual apps, there are several important contributions that investigate the role of health apps and digital media in processes of medicalisation. In a content analysis of mental health apps, Maturo, Mori and Moretti (2016) discuss how mechanisms of quantification and gamification support the medicalisation of mental spheres. Understanding apps as new engines of medicalisation, the authors point out that self-tracking apps foster a

neoliberal understanding of self and health and obscure structural inequalities. Further, in collaboration with Setiffi, Maturo (2016) published another paper on weight loss apps with similar conclusions: apps strengthen a biomedical and neoliberal understanding of obesity and obscure social and political causes. Comparable observations have been made by other authors such as Lupton in her analysis of sexual and reproductive apps (Lupton, 2015). Lupton notes that practices of self-quantification via apps comply with an increasing focus in neoliberal politics on emphasizing self-responsibility of citizens. She highlights potential consequences of self-quantification practices such as the stigmatization of and discrimination against individuals who choose not to engage in self-monitoring. In an article on the Quantified Self movement, Ajana (2017) highlights that the members of the Quantified Self community represent ideal citizens as they tend to understand self and health as in constant development and in continuous need for improvement – a perception that complies with the ideology of an increasingly neoliberal healthcare system. In this context, Ajana points out how self-monitoring participates in a shift of responsibilities from healthcare experts to laypeople. Further, she notes that self-quantification can be understood drawing upon the

Foucauldian notions of biopower and biopolitics. Ajana states that as a consequence, techniques of quantification might strengthen norms associated with health and foster the exclusion of certain groups of people.

2.5 Digitized menses and bodies

As already mentioned, menstrual tracking via apps builds upon a long history of self-observation of menstrual cycles and associated symptoms. Nevertheless, there are some important differences between non-digital and app-supported forms of period tracking influencing and potentially altering users' understanding and experience of their bodies and menses. These differences include smartphones' ubiquity and intimacy (Goggin, 2011). Goggin notes that given the constant availability of smartphones and apps, the temporal and spatial possibilities of self-tracking are expanded, and aspects of everyday life, bodies and identities are rendered much more visible, calculable and controllable. Consequently, bodies are increasingly understood as projects that require constant monitoring and improvement, thus supporting an ethos of self-government and self-management of health (Ajana, 2017). The continuous pursuit of self-improvement expands the temporal scope of self-tracking towards the future (Sherman, 2016) and contributes to a perception of bodies as in a constant state of becoming (Ruckenstein, 2014). The temporal expansion of self-tracking also affects the experience of the past as highlighted by Bossewitch and Sinnreich (2013). Highlighting that digital memories increasingly

exceed the knowledge people possess about their bodies and selves, the authors note that people tend to increasingly rely on machines as “cognitive prostheses” (226) as devices progressively replace users’ memories. According to Bossewitch and Sinnreich, this leads to an ontological crisis as it calls into question the understanding and construction of identities.

The common belief in the objectivity of machines and algorithms represents another important specificity of digitized forms of self-tracking. Lupton (2013) notes the importance of the visual in digital technologies in order to establish credibility. For Lupton, visual depictions of the body through digital mobile technologies can be conceptualized as an extension of visualization technologies in medicine, forming part of a bigger shift from the haptic to the optic recording of bodies. Drawing on Duden, the author emphasizes the understanding of the visual as objective truth. Ruckenstein’s (2014) findings confirm this observation as members of the Quantified Self community understood their devices’ visualizations as more factual than their subjective impressions. Ruckenstein highlights that greater visibility increases the pressure on individuals to assume the responsibility for their health. The belief in the objectivity of digitized

processes is also examined by authors focusing on the consequences of datafication (van Dijck, 2014), quantification (Espeland & Stevens, 2008), and the widespread use of algorithms (Gillespie, 2014). Espeland and Stevens argue for an understanding of quantification as a social process having ethical implications. Drawing upon Foucault, the authors emphasize the role of numbers in disciplinary practices as they serve as “key mechanisms for the simplifying, classifying, comparing, and evaluating that is at the heart of disciplinary power.” (414). Further, they also note quantification’s ability to make formerly invisible people, objects and characteristics visible, hence expanding the spatial surveillance of Foucault’s panopticon. Espeland and Stevens warn that in a world saturated with numbers, the real is easily reduced to the measurable, thus providing a narrow image of complex realities. Drawing on sociology of knowledge, Gillespie (2014) discusses how algorithms influence what we know, how we know and how this in turn has an impact on social and political discourses as well as public knowledge. For the author algorithms “are a key logic governing the flows of information on which we depend” (167). Gillespie further emphasizes that technologies do not solely represent but “help to constitute and codify the publics they claim to measure”

(198). Algorithms have been shown to carry specific values (Gitelman, 2013) and to build upon certain conventions which include gendered, biomedicalised, and classed assumptions (Mackenzie, 2005). However, these biases are difficult to identify for users as algorithms are invisible because they are infrastructural and often not made public due to market reasons (Gillespie, 2014). Examining the mechanisms through which algorithms acquire their objectivity and thus legitimization, Mackenzie draws on Butler's concept of performativity. The author notes that human influence and underlying ideologies are invisibilised by drawing on and covering over their constitutive conventions. Hence, given that digital technologies such as apps for self-tracking are based upon algorithms, they are likely to perpetuate discriminatory norms and beliefs via inbuilt biases.

Digitized ways of self-monitoring do not solely influence the understanding and experience of bodies but also construct and configure novel practices and forms of embodiment. There exists a variety of approaches from the social sciences to grasp the changes that occur when bodies interact with digital technologies, whereas phenomenological and post-phenomenological theories of embodiment are among the most popular approaches. Merleau-Ponty's conception

of the lived body represents a prominent starting point. Merleau-Ponty notes how people's embodied experience of the world can be diminished through illness as well as extended through the use of devices (Zeiler, 2013). Citing the example of a blind man who enhances his sensory-motor capabilities with a stick, Merleau-Ponty highlights its "incorporation", leading to a perception of the stick as an extension of the body (72). As indicated by the term, post-phenomenological approaches build upon phenomenological conceptions of experience but adopt a more critical approach on the role of technology in mediating people's experience of the world (Verbeek, n.d.). One example for an empirical study on digitized forms of self-observation and employing post-phenomenological theories is Kristensen and Prigge's (2018) examination of self-trackers' interactions with their technological devices and data. Extending the work of Ihde and Verbeek, the authors identify four types of human-technology relations, whereas each type describes a different extend of interaction, reaching from integration of technology into everyday life as a kind of background to the merging of the bodily self with technology. Whereas in the former case users attribute a minor role to technology, in the latter devices are perceived as concrete extensions of the human body, thus

broadening its sensory apparatus. Regarding the merging with technology, the authors cite the example of participants who associated the visualizations generated by their devices with a feeling of the bodily self.

Whereas the visual plays an important role in app-supported self-tracking, Pink and colleagues (2016) argue to also take into account the role of hands when researching the use of mobile devices. Drawing upon embodiment literature and affective theories, the authors argue that the use of mobile devices can be understood as an affective and sensory experience. Following Marks' conception of "haptic visuality", Pink and colleagues stress the utility of understanding touch and vision as intertwined sensory modalities of knowing, learning and sensing.

Changes in embodiment through the use of mobile digital technologies are also highlighted by Lupton (2013). Examining the impact of mobile health technologies on the concepts of health, embodiment and identity, the author notes that the visualization of body through mobile technology produces a spectacular, visible body, and enables users to engage in practices of embodiment. Whereas this can have empowering effects, Lupton warns that digital health technologies tend to privilege visual and metric representations of the body over people's experiences

and accounts and are likely to contribute to enhancement and healthist discourses.

There are several interesting approaches aiming to grasp novel forms of embodiment established through the interaction of human bodies and the data produced during self-tracking via digital technologies. One of the most prominent attempts to grasp the interrelations between bodies and digital technologies is Haggerty and Ericson's (2000) conception of the “data double” (605). According to the authors, data doubles come into being through the abstraction and separation of human bodies into information flows, which are then reassembled to give rise to a “decorporealized body, a 'data double' of pure virtuality” (611), which they understand as “a new type of individual, one comprised of pure information” (614). As highlighted by the authors, data doubles provide a means for knowing and invite for analysis and intervention, an observation that has gained importance in times of self-tracking. Smith's (2016) notion of the “data-proxy” (110) describes data-generated bodies and their impact on and interaction with material bodies. The author highlights that the emergence of data-proxies transforms conventional understandings and experiences of the body and influences how people present and manage their identities. Smith

notes that bodies are increasingly understood as trackable and mineable resources requiring considerable amounts of labour to control and manage the digital information they produce. The wish for control stands in contrast to the limited agency people possess regarding the management of their data. In this context Smith also notes the influence of social factors such as gender, class and age on people's agency.

Deleuze and Guattari's (1987) assemblage represents another frequently used framework to conceptualize the interactions between bodies and digital media technologies. Assemblages can be understood as a "multiplicity of heterogeneous objects, whose unity comes solely from the fact that these items function together, that they "work" together as a functional entity" (Haggerty & Ericson, 2000: 608). As highlighted Haggerty and Ericson, assemblages "comprise discrete flows of an essentially limitless range of other phenomena such as people, signs, chemicals, knowledge and institutions." (608). For the authors, assemblages question the traditional perception of phenomena as bounded, structured and stable, and can be understood as momentary fixations of these flows. For the study of digital self-tracking technologies, Lupton (Lupton, 2013b) has taken up Haraway's cyborg - arguably the most popular concept to examine human-

machine relations - and linked it to the concept of assemblage, which she describes as the “idea that human bodies are viewed as complex and dynamic configurations of flesh, others' bodies, discourses, practices, ideas and material objects.” (6). For the author, new digital health technologies such as apps for self-observation give rise to a kind of cyborg which she terms the “digital cyborg assemblage” (2). Lupton highlights how the digitally engaged patient can be understood as a combination of text, machine, body and metaphor, involved in practices of self-examination, -surveillance and -improvement. In another paper aiming at the better understanding of the relationship between humans and digital data, Lupton (Lupton, 2016a) draws upon the Harawayan concept of companion species: Lupton notes that the novel digital data-human assemblages created through self-monitoring practices can be conceptualized as “digital data companion species” (3). Lupton stresses how through their mutual interaction, people and technology influence each other, learn from each other and thus co-evolve.

2.6 Privacy and Surveillance

Most of the theoretical approaches aiming to grasp the processes and consequences of contemporary surveillance systems either build upon George Orwell's "Big Brother" or Michel Foucault's "panopticon". For instance, a popular concept from the field of surveillance studies that refers to Foucault's panopticon is Bauman and Lyon's (2013) "Liquid Surveillance". Drawing upon Bauman's notion of "liquid modernity" – a concept that aims to grasp modern societies' constant movement, uncertainty, and ephemerality - the authors highlight that modern surveillance "slips into a liquid state." (6). The authors note that in contrast to Foucault's panopticon, today's post-panoptical surveillance does not require the presence of surveillant agents or architecture. Rather, surveillance can be carried out at a spatial and temporal distance. According to the authors, new surveillance processes are predominantly based upon information processing and security discourses play a major role in the development and proliferation of monitoring technologies. Further, Bauman and Lyon point out that one of the most pressing issues of modern surveillance might not be the loss of privacy but rather the strengthening of social divides and the creation

of novel exclusions and oppressions, a process termed “*social sorting*” (17, emphasis in original).

The Deleuze-Guattarian notion of assemblage mentioned in the preceding section also represents prominent starting point to conceptualize contemporary surveillance systems. Noting that contemporary surveillance exceeds the Orwellian vision of a totalitarian state monitoring its citizens via telescreens in their homes and criticizing Foucault’s neglect of contemporary surveillance technologies, Haggerty and Ericson (2000) introduce the concept of the “surveillant assemblage” in order to address new forms as well as complex linkages and networks that result from the digitization of surveillance systems. Surveillant assemblages are described as emergent and unstable amalgams of fleshly bodies, digital data flows and technologies. According to the authors, surveillant assemblages reduce flesh into information and give rise to a new individual, the “data double”, as discussed above. Although Haggerty and Ericson’s surveillant assemblage has become a popular concept in the field of critical data studies, it has also been subject to major critiques, especially regarding its use of Deleuze and Guattari’s rhizome metaphor to conceptualize surveillant assemblages as having a levelling

effect on hierarchies. For instance, Ellis and colleagues (2013) note that the concept does not take into account the specificities of human experiences. The authors stress the importance of considering the complexity and ambiguity of spaces and emotions of surveillance and suggest the model of “affective atmospheres of surveillance” to examine the intertwining of the embodied, the affective and surveillance systems. Analysing an interview study on people’s knowledge, experience of and responses to surveillance, the authors develop an approach for the empirical investigation of surveillance: Ellis et al. suggest paying attention to the affective underpinnings in interviews in order to identify “not so conscious” processes of surveillance. Following Bucci, the authors highlight that these processes can be traced in speech acts such as vague expressions, disruptions and hesitations. The authors identify a number of dominant discourses in the interviews: “nothing to hide”, “Big Brother”, “become used to”, “not that conscious”, and “nothing can be done about it”.

In recent years, a growing number of publications on surveillance has focused on the role of digital data. One of the most prominent examples is Van Dijck’s (2014) article examining the ideological grounds of datafication and the consequences for surveillance processes.

Datafication is defined as the “transformation of social action into online quantified data, thus allowing for real-time tracking and predictive analysis” (198). In her analysis, van Dijck highlights problematic aspects of datafication such as the widespread belief in the objective quantification and the tracking of human behaviour through digital technologies, which stands in contrast to practices of data filtering and algorithmic manipulation. She coins the term “dataism” (198) to describe the ideology processes of datafication are grounded upon. Given the belief and trust people place into digital data, van Dijck notes that data have become a novel currency used by individuals in exchange for digital services. Further, the author adopts and refines Raley’s notion of “*dataveillance*” (emphasis in original) defined as “a form of continuous surveillance through the use of (meta)data.” (198). According to van Dijck, dataveillance differs from other forms of surveillance because it “entails the continuous tracking of (meta)data for unstated purposes.” (205). Consequently, as pointed out by the author, dataveillance has far-reaching consequences for society as a whole. Mentioning Snowden’s disclosure of N.S.A. surveillance practices, Van Dijck stresses the responsibility of governments,

business and academia for adopting measures to avoid risks associated with datafication and build trust.

Whereas the studies discussed so far examine contemporary surveillance in relation to surveillance technologies and digitization in general, there is also a growing body of literature focusing specifically on digital health and self-tracking technologies. For instance, the concept of affective atmospheres has also been taken up by Lupton (2017) to investigate the use of digital health technologies. Raising the question “How does digital health feel?”, the author argues to conceptualize digital health technology use as an emotional and sensory experience influencing the perceptions of bodies, health and disease. Lupton stresses that the affective atmospheres approach allows for a study of the interactions of humans, nonhuman actors, space and place. Further, and in similar ways to Ellis and colleagues, she notes that the concept of affective atmospheres pays attention to subconscious and emergent processes. There are several other publications of the same author aiming to theorize the interactions between humans and digital data in the context of self-monitoring. For instance, Lupton (2016a) builds upon Mol’s observations in her essay “I eat an apple” to better understand the relationship between users and digital data. “I eat an

apple” examines the loss of control over and subsequent incorporation of food after it has been swallowed (Mol, 2008). According to Lupton (2016a), something similar occurs with digital data, as people lose control over the data their bodies ingest as well as emit. At the same time, and in a comparable way to the incorporation of the apple, the data become part of the human subject. These interactions between humans and data raise questions about subjectivities, agency and the political implications of human-digital data entanglements.

Although Bauman and Lyon (2013) stress that there might be more pressing issues, privacy represents a frequently mentioned aspect when focusing on surveillance processes and their consequences. In discourses on surveillance, privacy is often mentioned in relation to security, whereas the two factors are commonly understood as mutually exclusive, and loss of privacy is often seen as the price one has to pay for security (e.g. Ellis et al., 2013). However, the juxtaposition of privacy and security has been called into question by critical data scholars, emphasizing that privacy has important societal values. For instance, in a study on the practices and rhetoric of the Quantified Self movement, Ajana (2017) notes that the privacy versus security discourse emerging from the September 11 attacks has reached the

fields of healthcare and medical research. The author demonstrates how privacy discourses in the context of biomedicine are increasingly juxtaposed with “data philanthropy”, a term appropriated by the author to describe the “belief that data sharing is a positive act that can be beneficial to the public.” (9) as it is considered to play an important role in the advancement of medicine and healthcare. However, as underscored by Ajana, contrasting personal privacy and data-sharing contributes to a dangerous and misleading perception which does not acknowledge the social aspects privacy. The authors stresses that the desire for privacy does not necessarily arise from the need to hide negative acts or selfishness but rather represents a fundamental value of society related to the freedom of thought, free speech and setting limits to corporations and governments. She further notes that on a societal level, privacy violations do not only target individuals but have an impact on the society as a whole: Ajana names the example of Big Data practices and their role in the further categorization and discrimination of certain groups and individuals. The issue of privacy has also been taken up by Rosenzweig (2012) who argues for an adapted conceptualization given contemporary contexts of dataveillance. For the author, technological change needs to be taken

into account in order to tackle the rising tension between privacy and security. Referring to the context of national security dataveillance, Rosenzweig argues that the contemporary notion of privacy needs to be understood as an instrumental value used to protect other important values such as anonymity. The frequent juxtaposition of good and bad aspects of surveillance is also highlighted by Esposti (2014) in her article exploring the interdependence of big data, analytics and dataveillance. The author notes that surveillance practices are often considered a “necessary evil” (211), limiting the understanding of its social processes and consequences. Esposti lists a number of examples for dataveillance and underscores the dominant role of corporations in the shaping of contemporary surveillance. Giving the example of customers’ loyalty cards, she emphasizes that people tend to sign contracts without reading, thus consenting to data processing practices they are not fully aware of. Esposti stresses the asymmetrical relationship between companies or governments and consumers or employees, as the former imposes certain terms and conditions that have to be accepted by the latter in order to participate. Another example presented by the author is marketing. According to Esposti, marketing represents the fields where analytical intervention is most

widely used, for instance to identify the highest price customers are willing to pay. For Esposti, analytics are the “hurricane eye of digitization” (215) as they form the basis for the further use and value creation of the collected data. Given the common use of analytics for marketing reasons, big data discourses are predominantly shaped by marketing debates.

Regarding health apps in specific, there seems to be only a limited number of academic publications addressing the themes of surveillance and privacy. Ajana (2017) cites a study by Symatec which found significant security risks and flaws in health apps. These include vulnerabilities concerning the storage and management of the collected data and the lack of privacy policies. In a study on women’s uses of and relationships to fertility-tracking apps, Gambier-Ross and colleagues (2018) report that most participants were unaware and unbothered concerning the further use of their data. As for menstrual apps, I could not identify any scholarly publication focusing on privacy violations, surveillance and users’ responses. There is, however, a growing number of media reports highlighting fertility/ pregnancy/ menstrual apps’ data misuse. For instance, a pregnancy tracking app has been shown to share intimate information with users’ employers and health insurers (Green

et al., 2019; Harwell, 2019) and several period apps have been found to directly forward users' data to the social media network Facebook for targeted marketing (Privacy International, 2019; Rajagopalan, 2019). In fact, it seems that self-tracking technologies such as period apps have led to a whole new level of marketing, i.e. "biological marketing", an approach that adapts its strategies according to people's cycle phase (Green et al., 2019).

2.7 Gender in menstrual app design

Positivist views of technology have first been challenged in the 1970's when philosophers and sociologists of technology drew attention to the manifold relations between society and technology (Oudshoorn, Saetnan, & Lie, 2002). As highlighted by scholars of the field of Science and Technology Studies (STS), technological developments should not be understood as autonomous processes and artefacts as neutral objects but rather as a result as well as a source of the social context they are created and used within (Latour, 1993). Technological inventions can hence be understood as materializations of social norms and relations, playing an important role in their stabilization and naturalization. Interrelating feminist scholarship with the findings of STS has led to the development of the field of feminist Science and Technology Studies, highlighting the importance of taking into account gender (and thus power) relations when analysing technoscientific processes and artefacts (Wajcman, 2009). Whereas early accounts of feminist analysis of technology predominantly focused on women's exclusion from design and development processes ("women in technology"), subsequent streams explored women's role as users of technology ("women and technology"), often from either overly

optimistic or pessimistic point of views (Faulkner, 2001: 79-80). In the 1980's, the focus shifted toward the gendering of technology itself, leading to the analysis of the gendered character of technical expertise and artefacts themselves (Wajcman, 2009). The gendered character of technology has been designated as “gender in technology” to underscore that gender relations are embodied in and shaped by technological artefacts, and the term “gender of technology” (83) has been coined to refer to gendering processes through association (Faulkner, 2001). There are several popular (feminist) STS approaches to conceptualize the relations between gender and technology. One of the most prominent ones is based upon the Social Construction of Technology (SCOT) theory, which stresses the coproduction of society and technology. In this context, technofeminists such as Cockburn and Wajcman have drawn attention to the mutual shaping of gender and technology and have shown that gender-technology relations manifest themselves in gender structures, symbols and identities. According to Cockburn (1992) “technology itself cannot be fully understood without reference to gender” (32). Within feminist constructivist theories of technology, the gender script approach represents one of the most prominent concepts to analyse the gendering of technological objects.

Based upon the concept of the technological script by Akrich (Oudshoorn et al., 2002), the gender script approach examines how artefacts become gendered through designers' inscription of their visions, and how this gendering of artefacts impacts users' experiences and practices. The domestication approach developed by Silverstone and Hirsch represents another popular theoretical concept drawing attention to users' active role in the shaping of technological inventions. Via symbolical as well as practical work, users can transform, change or reject pre-inscribed meanings of technology, leading to “*unintended consequences*” (Faulkner 2001: 83, emphasis in original).

Feminist constructivist theories of technology such as the ones mentioned above have been criticized for having a stabilizing effect on gender as they often fail to conceptualize gender as malleable (Lagesen, 2015). In order to better address the dynamics of the social construction of gender, Lagesen argues for drawing on actor-network theory (ANT) and Latour's theory of action. For the author, ANT represents a useful approach for examining the role of technology in the “doing of gender” (444), which Lagesen defines as an ongoing process of making and unmaking of bodies, technologies, identities, norms etc. in this context. Latour's theory of action suggests analysing these assembling processes

of hybrid (i.e. human and non-human) elements in two steps: 1) examination of the ways in which new elements produce new uncertainties, controversies and relationships; 2) analysis of how actors deal with and overcome these uncertainties. Lagesen adds that it is through the management of controversies and the establishment of novel relationships that gender changes.

There are several studies emphasizing the gendered character of menstrual app design. For instance, in Epstein and colleagues' (2017) study on menstrual tracking in the US, the authors highlight the "feminine, flowery, pink aesthetics" of menstrual apps' interfaces and report on differing reactions to the gendered design by their participants. Epstein et al. further note inbuilt heteronormative assumptions in menstrual apps' design such as the connection most apps establish between ovulation tracking, menstrual tracking and sex life. The authors recommend improving menstrual apps' design by employing gender-neutral labels, iconography and functions. Gambier-Ross et al.'s (2018) study on fertility tracking apps also stresses the "pinkification" of some apps and reports that one participant changed to a more gender-neutral app as a result. Similar to Epstein et al., the authors conclude that developers should consider gender-neutral app

layouts. In a study on pregnancy and parenting apps, Lupton and Pedersen (2016) emphasize that apps reproduce stereotypes of good motherhood. Further, a critical discourses analysis carried out by Thomas and Lupton (2017) finds that apps designed for fathers employ simplistic and humorous elements and transmit norms of good fatherhood.

3 AIMS AND RESEARCH QUESTIONS

Although health apps are among the most dynamic and fastest growing developments in the area of healthcare (Research2Guidance, 2017), relatively little attention has been paid to people's practices, and experiences of app-supported health tracking. This especially concerns everyday uses of self-tracking as most research focuses on the Quantified Self community (Gabija Didžiokaitė, Saukko, & Greiffenhagen, 2018; Ruckenstein, 2014). Moreover, there is a lack of studies addressing the role of women in self-tracking (Epstein et al., 2017), which stands in contrast to the observation that self-monitoring apps target predominantly women as they build upon a tradition of long-established self-tracking practices regarding fertility and menses (Lupton, 2015). As highlighted by Gambier-Ross and colleagues (2018), given that we live in a world saturated with devices for health monitoring, it is crucial to better understand the uses and relationships with digital technologies. The authors emphasize that research about fertility-tracking apps is likely to lead to novel insights regarding aspects of the perception and experience of female bodies. Further, a better understanding of everyday self-tracking practices might contribute to the shaping of future technologies and implementations

(Gorm & Shklovski, 2019). The present dissertation aims to examine the lived experiences of app-supported menstrual tracking and examines its sociocultural implications.

The main research question is:

What are users' practices and experiences of app-supported tracking of menstruation and associated symptoms, and what are the consequences on sociocultural in_equalities?

More detailed questions are:

What are users' practices of everyday menstrual tracking and how do they respond when encountering difficulties? What are alternative or unexpected uses of menstrual apps? How does the use of apps for menstrual tracking influence the medicalisation of women's bodies? What are the consequences of app-supported menstrual tracking for the perception and experience of (sexed/ gendered/ digitized) bodies, menses, health and selves? What are the implications of app-supported menstrual tracking for gender and other sociocultural in_equalities? How do menstrual app users experience and react to issues of privacy and surveillance? What are the affects involved in app-supported menstrual tracking? How do users experience menstrual apps' design and workflows?

4 METHODS

The present chapter describes in detail the methods chosen in order to gain insight into the practices, experiences and consequences of app-supported menstrual tracking. With the aim to shed light on people's lived experiences and practices of period tracking, a qualitative approach was adopted that included interviews with menstrual app users, an auto-ethnography using several menstrual apps myself, and expert interviews with healthcare professionals, app developers, and menstrual/ cyborg artists. The design and analysis process of the interviews and the auto-ethnography strongly influenced each other not only because they were carried out around the same period of time, but also because users' and experts' accounts had a direct impact on my choices and experiences regarding app-supported period tracking. As evident from the two following extracts, experts' comments guided my decisions which menstrual apps to include in the auto-ethnography and the participants' responses influenced how I proceeded with the interviews:

“Interview with gynaecologist: I download the “womanlog” app.”
(Autoethnography, 01.11.2016)

“After my first interview in Granada I decide to download ‘mi

calendario' app which offers a forum in Spanish, I hope to find participants there" (Autoethnography, 01.10.2016)

From a new materialist perspective, the entanglements and interactions between my interview participants, smartphones, apps and myself can be understood as a "research assemblage" (Alldred & Fox, 2017), in which my own and others' embodied experiences influenced the research and analysis process.

4.1 Interviews with menstrual app users

Semi-structured face-to-face interviews were carried out with twenty-six participants in Vienna, Austria and Granada, Spain between June 2016 and March 2017. Recruitment of the interviewees followed a purposive sampling procedure guided by the theoretical framework that also informed the research questions. Inclusion criteria were use or former use of an app for menstrual tracking and age over eighteen. All interviews were audio-recorded and subsequently transcribed verbatim for analysis. A qualitative content analysis was performed through general reading of the transcripts (Hsieh & Shannon, 2005), supported by the QSR NVivo 11 program (QSR International, Melbourne, Australia). The identified themes were then framed drawing on related literature. In order to adhere to qualitative reporting standards, I followed the 32-item consolidated criteria for reporting qualitative studies (COREQ) checklist (Tong, Sainsbury, & Craig, 2007), as well as the standards for reporting qualitative research (SRQR) (O'Brien, Harris, Beckman, Reed, & Cook, 2014).

4.1.1 Elaboration of user interview guidelines

For the interviews, a semi-structured protocol was elaborated based on themes identified via related literature on digital technologies (e.g.

boyd & Crawford, 2012; Albrechtslund, 2007; Krieger, 2013), health tracking (e.g. Lupton, 2014; Peng, Kanthawala, Yuan, & Hussain, 2016) and menstruation (e.g. Chris Bobel & Kissling, 2011; Newton, 2016). The interview protocol was continuously adapted according to the feedback of the interview participants and novel themes which were identified during the literature review. The interview guidelines comprised six major sections: 1) technology and smartphone use in general, including IT literacy, affinity and the use of health-related digital technology; 2) menstrual app use with a focus on the purposes of use and consequences on understandings of menstruation, health and self; 3) body and body image, including the perception of menstrual cycles and associated factors; 4) interactions with family, partners, friends and healthcare professionals such as gynecologists concerning menstruation; 5) privacy and security issues arising from menstrual app use and associated emotions; 6) gender representation in menstrual apps. For the interviews with the three participants who had stopped app-supported period tracking prior to the interviews, questions about their reasons for stopping and alternative ways of menstrual cycle tracking were included. As this was a feminist endeavor, the questions aimed to raise awareness of power relations, (gender) inequalities and

encourage users to reflect on their agency and limitations concerning menstrual app use. For instance, the interviewees were asked whom they assign the responsibility to concerning the security of their menstrual data. Regarding the gendering of menstrual app design, the participants were asked to envision a period app designed for men. The interview guideline, demographic questionnaire, and consent form can be found in the annex.

4.1.2 Procedure

The study was approved by the ethics committee of the University of Granada (Nr. 219/CEIH/2016, see annex). In a purposive sampling procedure, the interview participants were recruited via my own and my supervisor's private as well as professional networks, including the use of social media platforms and contacting of specific health centres and non-governmental organizations (NGOs). Based on my geographical, cultural and linguistic origins and competencies (I am based in Granada, Spain but originally from Austria), the participants were recruited from Granada and Vienna. The first round of interviews took place in Vienna in July 2016. Four interviewees were recruited via Facebook groups (“KSA” and “Gender Studies”, both Facebook groups of students of the University of Vienna). Following transcription and

first analysis of the interviews, the interview guidelines were adapted accordingly, and a second round was carried out in Vienna in September 2016. This time, participants were recruited via social media platforms, online job portals and online marketplaces (fragnebenan.at, jobwohnen.at, flohmarkt.at), through contacting of relevant NGOs (Association of Endometriosis Austria, Women's Health Centre, Association of Trans Men Austria), as well as through private networks (friends and former work colleagues). Four participants were recruited via social media platforms and online job portals and three were friends or work colleagues of friends. Interviewing and recruitment of the Granada participants took place between October 2016 and March 2017. Five of the participants from Granada were recruited by my Granada supervisor Nuria Romo-Avilés through private and professional networks, one was a colleague of mine from the university, two were friends of the interviewees and two were distant acquaintances. In order to enhance the diversity of sociodemographic profiles, Granada-based NGOs as well as health centres were contacted, which led to recruitment of three additional participants. In February and March 2017, two interviews were conducted with a work colleague from Bologna, Italy and a friend of a colleague from San Sebastian,

Spain. All the interviews have been carried out by me. All but one interview were conducted in the native language of the participants (Spanish or German) and one was completed in English. Four interviews were carried out via online conference tools and the remaining twenty-two were completed face-to-face at participants' homes, workplaces or in coffee places. The interviews lasted between forty-five minutes and one hour. Drawing on a paper by Pink et al. (2016), which stresses the importance of researching mobile media use through the hand, participants were encouraged to open their period apps and go through their functions during the interview. All interviews were audio-recorded with participant consent. After the interviews, participants completed a short questionnaire to gather socio-demographic data. Within hours or days after the interviews, field notes were taken to guarantee thorough documentation of the process. The notes describe the recruitment process, my impressions of the participants and themes that emerged during the interviews that seemed to be of particular interest for further elaboration of the interview questions and the analysis process. Moreover, and since this is a feminist endeavour which foregrounds situatedness and reflexivity, I have also documented my emotions and sensations. The process of

recruitment was terminated when the variation of profiles sought had been completed and data saturation had been reached, i.e. no new themes emerged from the analysis.

4.1.3 Participants

With the aim of drawing on a diverse pool of participants, inclusion criteria were broadly defined: 1) over eighteen years old and 2) use or former use of an app for menstrual tracking. As mentioned above, there were twenty-six participants in total: eleven living in Vienna, Austria or the surrounding area, and thirteen were from the Granada province in the south of Spain. To maximize the variation of participants' profiles and their experiences, two additional interviews were performed with one participant from Bologna, Italy and one from San Sebastian, Spain. Regarding the participants' gender identity and sexual orientation, all but one interviewee identified as female, and twenty participants were heterosexual. One interviewee self-identified as non-White. Age range, level of education and digital literacy of our participants confirmed the findings of preceding studies stating that mobile app users are generally younger with higher levels of education and e-health literacy than non-users (Bol, Helberger, & Weert, 2018; Elavsky, Smahel, & Machackova, 2017): the participants' ages ranged from eighteen to forty

years with twenty-one (81%) being under the age of thirty-five. Most were academics or university students (21), four held a PhD. Most self-identified as users with average (9) or high (13) digital media literacy. Five mentioned to suffer from a medical condition that influenced their menstrual cycles. The profiles of the app user interview participants are presented in table 1.

Participant Nr.	Gender Identity	Sexual Orientation	Age (at time of interview)	Digital Literacy	Health Status	Menstrual App Used	Educational Level	Country of Residence
1	female	heterosexual	29	average		Clue	academic	Austria
2	female	heterosexual	30	average		OvuView	academic	Austria
3	female	bisexual	25	high	thyroid disorder suspected thyroid disorder	Clue	academic	Austria
4	female	homosexual	22	high		Flow	academic	Austria
5	female	heterosexual	37	high	thyroid cancer (past)	Period Tracker	academic	Austria
6	female	heterosexual	34	high		Period Tracker	non-academic	Austria
7	female	heterosexual	28	average		NFP	academic	Austria
8	female	heterosexual	36	high		Clue	academic	Austria
9	female	heterosexual	32	average	amenorrhea	Clue	academic	Austria
10	female	heterosexual	18	average		Mcycles and Clue	non-academic	Austria
11	female	heterosexual	28	high		ex-user	non-academic	Austria
12	female	heterosexual	26	average		mi calendario	academic	Spain
13	female	heterosexual	18	average		Clue	academic	Spain
14	female	heterosexual	32	average		mi calendario	academic (PhD)	Spain
15	female	heterosexual	32	high		my days	academic (PhD)	Spain
16	female	homosexual	32	high		ex-user	academic	Spain
17	female	homosexual	31	not disclosed		Clue	academic	Spain
18	female	heterosexual	40	high		mi calendario and clue	academic (PhD)	Spain
19	female	heterosexual	23	high		recordatorio pildora	academic	Spain
20	female	heterosexual	23	low		mi calendario	academic	Spain
21	female	heterosexual	30	low		womanlog	academic	Spain
22	non-binary	homosexual	35	high		widget	academic (PhD)	Italy
23	female	heterosexual	21	high	amenorrhea	ex-user	non-academic	Spain
24	female	heterosexual	18	average		Period Tracker	non-academic	Spain
25	female	heterosexual	29	high		period Tracker	academic	Spain
26	female	bisexual	27	not disclosed		mi calendario	academic	Spain

Table 1: Participant Profiles Menstrual App User Interviews

In terms of menstrual app use, three participants had stopped tracking their menstrual cycles via apps prior to the interviews, and the remaining twenty-three were using either one or several period-tracking apps (seven of the participants mentioned to be using or have been using more than one menstrual app at a time and three users reported to have used different period-tracking apps before). The majority of our participants (22) were using or had been using either Clue, Period Tracker or My Calendar (Mi Calendario in Spanish), making these three menstrual apps the most popular ones in our study. All the other period-tracking apps (8) were used by only one interviewee each. This resonates with market reports' findings on health app adoption stating that a small percentage of health apps account for most of the overall downloads (Aitken et al., 2017). Most of the participants reported on long-term engagement in app-supported menstrual tracking: at the time of the study, more than two thirds of the participants (17) had been using their menstrual apps for one to three years. Six interviewees mentioned to track their periods for six months or less and one person estimated to have started using a menstrual app at least five years ago. All but one participant used menstrual apps that were free of charge, and almost all interviewees (24) were using an app in their native

language. Eight interviewees pointed out that their apps included advertising.

4.1.4 Access to participants

Although periods have received increasing scholarly and academic attention in recent years, menstrual taboos remain and continue to shape people's experiences (Bobel, 2010). In the present study it seemed that my gender and the fact that I am menstruating myself helped facilitate access in many cases. This was pointed out for instance by one of the interviewees who spoke of menstruation as a “bond between women” (Pt. 10, 18 years old).

Against the background of menstrual stigma, it was particularly interesting that some of the interviewees stated to participate in the study with the objective to fight against menstrual taboos:

“I think it is an incredibly important topic. About which should be definitely spoken. I think this is the reason why we are here today (laughter). No, I really think it is important and nobody has to be ashamed or talk it down somehow.” (Pt.1, 29 years old)

Moreover, some participants appeared to want to help and yet others saw the interviews as an opportunity to learn more about their cycles and menstrual apps:

“So, I am currently [learning about my cycle], this is also why I immediately, I immediately wanted to participate in the study.”
(Pt.5, 37 years old)

Nevertheless, access was not straightforward to all participants. In order to recruit menstrual app users with profiles differing from my own profile (academic, middle class, White, cis female), my supervisor and I contacted health centres and NGOs in Granada and Vienna. This led to the recruitment of three additional participants. However, most of the NGOs contacted declined my requests. The main reasons for rejection stated by the institutions were lack of interest and saturation with research requests.

4.1.5 Data analysis

All the interviews were transcribed verbatim in their original languages. Interviews in German and English language were transcribed by myself, and the recordings in Spanish were transcribed by an experienced researcher and colleague of my supervisor. Then, an inductive content analysis was performed, where coding categories are derived directly from the text data (Hsieh & Shannon, 2005). General reading of the interview transcripts was followed by codification, which was carried out independently by Granada supervisor Nuria Romo-

Avilés and me. We then contrasted the codes and categories we had identified and reached consensus based on the criteria for thematic units of interest. The final categories we used for the analysis were organized around the following thematic fields: 1) technology use; 2) menstrual app use; 3) menstruation; and 4) medicalisation. Moreover, the two open nodes “Gender” and “Affects” were applied for passages where participants specifically mentioned these issues. The analysis was supported by the N-VIVO 11 program for qualitative data analysis (QSR International, Melbourne, Australia).

4.2 Expert interviews

In addition to the fieldwork with menstrual app users, I have conducted interviews with two healthcare professionals, two app developers, two menstrual artists and a cyborg activist. The aim was to gain first insight into experts' perspectives, to support the elaboration and adaption of the interview guidelines, and to inform the analysis process of the user interviews and autoethnography.

4.2.1 Elaboration of the interview guidelines

Healthcare professionals

For the interviews with healthcare professionals, a semi-structured protocol was elaborated based on themes that arose during preparation and realization of the user interviews. The interview protocol comprised three major sections: 1) menstruation in general and associated illnesses; 2) possibilities and challenges of apps for menstrual tracking; and 3) patient-doctor interactions (the interview guidelines in Spanish language can be found in the annex section). The questions aimed to explore the experiences and opinions of healthcare professionals and to raise awareness in regard to potential changes through app-supported menstrual tracking such as shifts in responsibilities, patient empowerment and healthism discourses.

App Developers

For the interviews with app developers, a semi-structured protocol was elaborated which focused on five principal themes: 1) profile and motivation of the developer and the company (if applicable); 2) developer's experience and use of mobile digital technologies; 3) description of the app in development; 4) contacting and interaction with potential users during the development process; and 5) privacy and security settings (see annex for designer interview guidelines). The questions aimed to gain insight into developers' opinions and motivations and sought to raise issues of potential power imbalances between users and developers.

Menstrual Artists

For the interviews with the menstrual artists Marinella Manicardi and Loredana Magazzeni no specific protocol was elaborated. Rather, the artists were encouraged to reflect upon their artworks and experiences when presenting them.

Cyborg Activist

For the meeting with cyborg artist and activist Moon Ribas a few core themes were prepared, including the question for their definition of a

cyborg, the motivation behind becoming a cyborg and their experiences in private as well as public life.

4.2.2 Procedure

The interviews were carried out between July 2017 and August 2018, i.e. almost throughout the entire project duration. While the two developer interviews were conducted via video conference tools, the remaining interviews took place face-to-face. The experts were recruited via two principal ways: 1) internet searches for companies or individuals developing menstrual-cycle-related or similar apps followed by contacting via e-mail, and 2) recruitment of experts through the professional networks of my supervisors in Granada and Bologna. Further, the cyborg activist forms part of my networks, and one of the app developers contacted me via social media networks (researchgate.net). The first developer interview was conducted in July 2016, followed by two interviews with healthcare professionals in January and February 2017. The interview with the cyborg was carried out in November 2017, and the interviews with the menstrual artists were conducted in January and February 2018. In August 2018, the second app developer interview took place. Two of the interviews (one developer and one healthcare professional) were audio-recorded with

participant consent. The other interviews presented informal exchanges rather than structured interviews and were not audio-recorded. During and after all of the interviews, I documented the most relevant inputs and my personal impressions.

4.2.3 Participants

The first developer interview was conducted with an app designer and psychologist from Vienna, working on a prototype of a pregnancy app for migrant women at the time. After contacting her by e-mail, she immediately agreed to participate. As we did not manage to meet in person during the first round of user interviews in Vienna, we decided to meet via an online conference tool. The designer seemed to be highly sensitive to power relations and sociocultural inequalities, especially those concerning differences in gender identity and regional/ national/ cultural background. The app project aimed to improve migrant women's experiences with healthcare professionals during pregnancy. The healthcare professionals who agreed to be interviewed were both from Granada and recruited via the professional networks of my Granada supervisor. One was a gynaecologist and researcher at the University Hospital of Granada, the other one was a general practitioner at a healthcare centre in Granada. The gynaecologist was well informed

about menstrual apps and had a very critical point of view regarding their role in patient empowerment and processes of pathologisation as well as normalization of cycle-associated symptoms. She also pointed out that many users might not be able to use all the features offered by menstrual apps due to a lack of the necessary skills. The general practitioner did not appear to have much experience regarding the use of menstrual apps by her patients. However, she provided insightful inputs concerning her experiences with patients and supported the recruitment of further participants for the user interviews. The meeting with cyborg activist Moon Ribas took place in Barcelona, the artist's hometown. Moon told me about her understanding of a cyborg and her process of becoming a cyborg through seismic sensor implants. Further, we discussed her experiences when performing on stage and the ethical implications of acquiring an additional sense. During my secondment at the University of Bologna, I had the chance to meet with two artists working on menstruation. Marinella Manicardi, an actress and book author from Bologna, agreed to meet me in the city's library of women. Marinella's focus laid predominantly on the role of monotheistic religions, in specific Catholicism, in the shaping of menstruation as a shameful and repelling process. The second menstrual artist I met in

Bologna was Loredana Magazzeni, a poet and translator who had published a collection of poems on menstruation. The main themes of the poems included the connection of menstruation to the moon phases and nature in general, references to myths and religion, shame, honour and power. Loredana also provided me with further references regarding menstrual art. The second app developer contacted me via e-mail after having heard about my research project from a former university colleague. As a feminist hacker, she was working on the development of an open-source period-tracking app which aimed to provide users with reliable information on future period and fertility dates. The developer and hacker offered especially useful inputs concerning technical and ethical details of the app development such as issues of transparency and control.

4.2.4 Data analysis

As the expert interviews aimed to support the elaboration and adaption of the interview guidelines and to inform the process of analysis, the most important aspects were identified either during the interviews or afterwards through listening to the audio recordings and gathered in text files.

4.3 Autoethnography

From October 2016 to October 2017, I conducted an auto-ethnography using several menstrual apps. The present section describes the process and development including the specificities of an auto-ethnographic engagement with self-tracking technologies. Then the analysis as well as the ethical implications and limitations are outlined.

4.3.1 Procedure

In a first step, a literature search has been carried out in order to guide the autoethnographic process. The articles I identified included related methodological articles (e.g. C. Ellis & Bochner, 2000), feminist autoethnographies engaging with the body and issues of health and illness (e.g. Esteban & Ceic, 2004), and autoethnographic accounts on body-technology-interactions (e.g. Rettberg, 2016). Given that an autoethnography is commonly defined as a combination of autobiography and ethnography (C. Ellis, Adams, & Bochner, 2011), accounts from autobiography studies have been consulted as well (e.g. Okely, 1992).

During a one-year-long process, I used several menstrual apps myself, documenting all relevant events in what I decided to call the “menstrual app diary”. As the central function of period apps is to record menstrual

dates and associated corporeal sensations, emotions and experiences, I decided to start the autoethnography on the first day of my menstrual cycle (i.e. the first day of menstrual bleeding) in October 2016. The autoethnography ended one year later with the start of my period in October 2017. As for my profile, I identify as a White academic cis woman from a middle-class family with an Austrian-German background. At the time of the autoethnography, I was thirty-two years old, living in a heterosexual relationship with no children. I perceived my menstrual cycle as regular and did not suffer from any severe symptoms associated with menstrual cycles. I did not use any menstrual or other health apps before and would rate my digital literacy as slightly above average. Before the autoethnography, I used to track my period dates by adding a note to my smartphone's calendar.

In its structure, the menstrual app diary can be described as an emotional-sensational protocol, documenting my experiences and interactions with different apps for menstrual tracking. The organization of the diary was inspired by the apps' structure and the logic of the menstrual cycle: entries are sorted by date in a chronological order and organized in bullet points. Moreover, most records can be found in temporal proximity to the start of menstruation,

on the first days of menstruation, and during ovulatory phases. Regarding the content, the main themes of the diary reflect the apps' tracking categories: the majority of entries reflect upon menstrual-cycle-related emotions, sensations, experiences. Few records are reactions to newsletters or pop-up messages app companies had sent me. Besides written entries, I also included screenshots of the apps' interfaces to underscore the interaction that was taking place between them and myself. In addition, some diary entries reflect upon and are influenced by the app user interviews which took place in the same time period. When comparing earlier and later records, changes concerning my perception of menstrual apps and regarding my engagement with them can be noted. The phases I have identified are similar to the stages described by Light, Burgess and Duguay (2016) in their elaboration of an approach to study the use of apps: 1) registration and entry consisting of selection of menstrual apps as well as download and installation including the entering of first data; 2) everyday use of the apps whereas I noted a decline in the data I have entered over time and the emergence of preferences for certain apps over others; and 3) closure and leaving, whereas I continued using one of the apps after the end of the auto-

ethnography. A screenshot of the menstrual app diary is shown in figure

4.

02.10.2016:

- since my period has started today, I decide with the use of menstruation apps: in google store, I am searching for 'period', receiving a lot of options to choose from.. with how many apps should I start?
- I identify 4 potential apps: Clue, Flo, Eve by Glow and Maya – or should I take one of the really pink ones? I decide to check them on my laptop again.
- Finally, I decide to download three apps on my android: Clue (Germany), Period Tracker (USA, pink!) and Eve by Glow (USA). The other ones I leave for later.
- Downloading Clue: opening the app they tell me that they want to get to know me better. They ask for the date of my last period, PMS, length of cycle and some more. This is always followed by explanations (short texts including bibliography). I decide to open a clue account (johannalevy@ugr.es – icky) that will save my data. Therefore, I need to agree to the privacy statement (I start reading it, they try to keep it clear and simple and offer a link to the article 'what it means to be a good data company → read it!) and to confirm that I am older than 13.
- Downloading Period Tracker: needs access to my photos, media, files; includes advertising – I open the app, it asks me for an account to save my data – I enter the same email and password, I don't see anything connected to privacy. Opening it, I enter my cycle, moods, cramps etc. I decide to set alerts for start of period, ovulation and fertile phase. Changing the skin is only possible in the deluxe version :(I discover a function to send my data collected to my email.
- Downloading Eve (in english): Terms and Privacy Policy – I oversee that entering the app ('get it girl' 'body positive'), I sign in with my ugr email and a pw: icky2013 – terms and privacy policy – I start reading it, too long – I just agree. Then, I have to add my birthday. I enter some symptoms and immediately get told not to eat candy! All in all, I lost the overview.

Figure 4: Screenshot Menstrual App Diary

4.3.2 Data analysis

Using the same approach as for the analysis of the app user interviews, an inductive content analysis was performed through general reading of the menstrual app diary, followed by the identification of codes which were derived directly from the text (Hsieh & Shannon, 2005). The procedure included the text of the screenshots of the apps' interfaces which form part of the menstrual app diary. The reading and identification of first codes was carried out independently by two

researchers, my supervisor from Bologna, Zelda Alice Franceschi, and me. Subsequently, the identified codes were discussed and contrasted until consensus was reached. The final categories were organized around the following thematic fields: 1) interactions; 2) app features and design; 3) changes in perception; and 4) affects. Moreover, the two open nodes 'Gender' and 'Privacy Issues' were created as they represented themes that pervaded most of the text. The analysis was supported by the N-VIVO 11 program for qualitative data analysis (QSR International, Melbourne, Australia).

4.4 Ethical Implications

4.4.1 User interviews

Prior to the start of the interviews, the study was approved by the Research Ethics Committee of the University of Granada (219/CEIH/2016). The research complies with national Spanish law (Article Six, consent of the data subject of Spanish Organic Law 15/1999 of 13th December on the Protection of Personal Data), meets the GRACE project data management requirements and was carried out in accordance with the Data Protection Directive of the EU (EU directive 95/46/EC). This includes the storage of collected data on password-protected computers, backed up in password-secured files on external hard drives, anonymization and erasure of data when no longer required for the purposes they were collected for. Access to the original profiles of the participants was restricted to myself and my supervisory team at all times. All participants received information on the study objectives, responsible institutions and the funding body. All participants voluntarily agreed to participate in the project and signed an informed consent form.

4.4.2 Autoethnography

Given that auto-ethnographic accounts draw on the personal experiences of the researcher, ethical challenges are different from those concerning more traditional ethnographic methods. Lapadat (2017) points out three main ethical questions that arise when conducting an auto-ethnography: relational ethics, researcher vulnerability, and the usefulness of institutionalized ethics. Relational ethics acknowledges that autoethnographic writings always also include other subjects besides the researcher who might be identified and placed in vulnerable situations. Regarding my autoethnography, I addressed this issue by anonymizing the names of involved subjects and by limiting the information I provide about them. Moreover, as the study focuses on app-supported tracking, the majority of the text engages exclusively with the apps and my own sensations, emotions and experiences. Since I do not report on a difficult time in my life, researcher vulnerability does not seem to be a particularly important issue here. However, keeping in mind that menstrual apps store and potentially process the data I have entered without my knowledge, novel ethical issues and vulnerabilities arise. One of them has been highlighted by Ajana (2017), who stresses that users are likely to

contribute to the strengthening of societal norms via their engagement in app-supported self-tracking.

4.5 Limitations

4.5.1 User interviews

The user interviews have been developed and carried out with a bias toward understanding certain topics of interest, foregrounding issues identified by former studies on health-related self-tracking. Given its qualitative approach and the participant sample, the results are not representative of any particular population or specific type of menstrual app, but rather offer first impressions and insights into menstrual tracking practices, experiences and consequences. Future studies including mixed-method approaches are necessary to get insight into general patterns of menstrual app use and its implications. As mentioned above, the final demographic makeup of the participants was strongly influenced by my supervisor's and own networks (academic, White, middle class). Since interviews were carried out in three languages and different countries, differences in language skills and in knowledge of cultural specificities represented further obstacles in the present study. In order to minimize these difficulties, interview transcripts in German were translated to English language and all

transcripts were read repeatedly line-by-line and cross-checked by Nuria Romo-Avilés and me.

4.5.2 Expert interviews

The interviews with healthcare professionals, app developers and artists aimed to support the data collection and analysis process. Thus, and given the limited number of participants, no general conclusions can be drawn regarding healthcare professionals' and app designers' experiences and opinions on app-supported menstrual tracking.

4.5.3 Autoethnography

An autoethnography represents an approach that builds upon the researcher's subjectivity and emotionality (C. Ellis & Bochner, 2000). As a consequence, it has often been criticized for being too evocative, too little analytical and for lacking validity (Lapadat, 2017). As other qualitative approaches, the autoethnography I present here does not provide information on general patterns of menstrual app use but gives insight into my subjective experiences and practices. The weaknesses of an autoethnography can also be interpreted as its strengths: in contrast to traditional ethnographic methods, autoethnographies unite the researcher and the researched subject in one person, thus bypassing

concerns of appropriation, misinterpretation and power imbalances. In terms of reliability, especially concerning the phase of the data collection, I solely can guarantee my commitment to tell my subjective truth. However, also other qualitative approaches like interviews rely on participants speaking their truths. The analysis of the autoethnography focused on text. However, menstrual apps employ graphics and charts to inform and interact with their users. The importance of visual representations during self-tracking has been pointed out by scholars such as Rettberg (2016). Nevertheless, the present study does not include a visual analysis of menstrual apps as this would have gone beyond the scope of the project.

5 RESULTS

The present chapter presents the results of my study on app-supported menstrual tracking by drawing upon the menstrual app users interviews as well as the autoethnography. It is divided into five subchapters: 1) users' contexts and main motivations to track menstrual cycles via apps as well as their responses when facing difficulties, 2) shifts in processes of medicalisation, 3) changes in the understanding and experience of menses and bodies, 4) users' opinions on and reactions to issues of privacy and surveillance, and 5) the gendering of menstrual app design and users' suggestions for improvement.

Most of the statements included here have been extracted from the user interviews. The chapter does not comprise a specific section that focuses on the autoethnography. Instead, the autoethnographic quotes are integrated into the subchapters just as the user statements, conceptualizing them as an additional user experience.

Following queer scholars' notion that "not all women menstruate, and not all menstruators are women" (Quint, n.d.), and with the intention not to contribute to the strengthening of essentialist assumptions regarding menstruators' gender, I refer to the study's participants using the gender-neutral singular pronoun "they". Further, with the same

objective, the interviewees have been assigned a number instead of a pseudonym. The interview participants' profiles are presented in Table 1. If relevant, specific aspects of the participants' sociodemographic profile are highlighted.

5.1 App-supported menstrual tracking: contexts, reasons, practices

The present chapter reports on the process of selecting a specific menstrual app, the contexts of use, and provides an overview of the participants' main reasons to engage in app-supported period tracking and their most common practices. Further, I present information on alternative or additional methods of period tracking employed by some of the interviewees of the study. The present chapter builds upon an article reporting on the characteristics of app-supported menstrual tracking from a public health perspective (Levy & Romo-Avilés, 2019).

5.1.1 Selection of menstrual apps

In the major app stores, users encounter a plethora of apps for menstrual tracking (the exact number of period apps available is difficult to define as the app stores do not provide the respective details). In the interviews, I asked my participants how they learned about the existence of menstrual apps and their reasons for choosing one period app over the other. The most common approach to identify a suitable app was searching the app stores, whereas many interviewees simply assumed that there was an app for observation of periods:

“I took the initiative, I said, I have to check whether something like that

[menstrual app] exists.” (Pt. 6, 34 years old)

Altogether, twelve of the interviewees stated to have encountered menstrual apps by searching app stores. Many reported on having entered keywords such as “period” or “menstrual calendar” into the app stores' search function:

“Well, I have simply entered different terms [into the search function of the app store], such as 'calendar' or 'period' and then they [menstrual apps] appeared” (Pt. 4, 22 years old)

Others said that they encountered menstrual apps through adverts when randomly entering the app store as exemplified by the extract below:

Interviewer: “How did you come to know about [app-supported] period tracking?” – Pt.: Um, I have simply, um, I have been surfing in the [app] store and I have seen it there. And then I’ve been using it, at times.” (Pt. 11, 28 years old)

Thus, while some interviewees seemed to have come across menstrual apps rather accidentally, others intentionally searched for period apps. Most of the participants searching on app stores with the intention to find a fitting app for period tracking could not remember where they had first heard of their existence.

Among the participants who stated to have downloaded a specific menstrual app, nine said to have followed a recommendation by a

friend, and two interviewees downloaded an app suggested by vloggers (video bloggers):

“Well look, I didn't know that they [menstrual apps] existed but I watch a lot of videos of vloggers on YouTube and stuff, and thus I heard somebody talking about the topic and it seemed like a good idea, because I used to forget when I am on the period and I downloaded it.” (Pt. 25, 29 years old)

Three participants did not specify how they selected the menstrual apps they were using. For the interviewees who did not follow recommendations by friends or vloggers, the main reasons for choosing one period app over another were their graphic design and features, as well as good rating on app stores. Another common strategy of choosing a suitable app was downloading several ones and comparing them: seven of the participants mentioned using or having used more than one period app simultaneously in the beginning of app-supported menstrual tracking:

“I am using MCycles and Clue [menstrual app brand names]. And I'm using two [apps], because I wanted to find out which one I like better and because I have started using them only recently, I still use both.” (Pt. 10, 18 years old)

Once the participants had decided on a specific menstrual app, they usually kept using it for several years. The main reason for ongoing use of a certain period app was to ensure continuity in the collection of menstrual cycle-associated data. For instance, one of the interviewees who had changed smartphones and operating systems, regretted not being able to recover the data collected on the previous app:

“I mean it would have been cool if I had found the same [menstrual app], because if you have a Nokia phone, you are signed in via Windows ... and if you sign in again [into the same account on a new device], you are immediately, you can access all your data again. This is why I had hoped that Android offers the [same] app, but no.” (Pt. 4, 22 years old)

The interviewees usually changed from one menstrual app to another due to the purchase of a new smartphone and hence change in the operating system they were using (some menstrual apps are not offered for all operating systems). Some participants also mentioned to have switched to another menstrual app due to changes in their needs, as illustrated by the following extract:

”When I started using contraception to regulate my menstruation – now I know that it will be every three weeks, so I don't need something [an app] that predicts [my cycle] - so I uninstalled it and downloaded another one, which is called “recuerda pildora”

[“remember the pill” in English, menstrual app name], which basically tells you to take - well in my case it is about insertion and removal of the [vaginal] ring ... the reminder function of the [formerly used] app didn't work very well, so I looked for another one.” (Pt. 19, 23 years old)

In the above extract the interviewee describes the switch from one period app to another due to the use of hormonal contraceptives to regulate their cycles. As evident here, the participant used to engage in menstrual tracking primarily to be able to better predict future menstrual cycles. Being better informed about upcoming periods was one of the most commonly stated reasons to observe periods via apps for in this study. In this specific case, the use of the contraceptive ring seemed to replace the app's prediction function which prompted the participant to download an app offering a suitable reminder function telling them when to insert and remove their contraceptive ring.

5.1.2 Contexts of use

Following Lupton (2016), who stresses the importance of taking into account space and place when examining digital health technology use, I asked the participants whether they were using their menstrual apps in specific locations. While several participants mentioned to be

checking last period dates prior to or during gynaecological visits, and some of the interviewees pointed out to be tracking their periods predominantly at home, most said to be using their apps in any place, public or private:

“Wherever, as I'm outside a lot, that is, wherever I am, when I have time to check my phone. When my period starts, the first thing I do is to enter it into the [menstrual] applications.” (Pt. 18, 40 years old)

Whereas space and place did not seem to be relevant for most of the study's participants, time was highlighted as a crucial factor in period tracking, as stated in the extract below:

“More than the place it is the time, that is, when I'm in pain or thinking that it [menstruation] should start soon, or when I am ovulating. Sometimes I have twinges and I think that I am ovulating, and I look at the phone, at the calendar to see if I'm due.” (Pt. 22, 23 years old)

Whereas a few participants stated to be using their period apps mainly during menstruation and ovulation, several pointed out to check their apps in order to verify symptoms as mentioned in the statement above. Further, menstrual apps were employed in specific situations such as

planning of vacations and work life, or when engaging in sexual relations:

“When I am having [sexual] relations I use it [app] more, I am more attentive. Or when I am planning something, and I say ah let's see when I'll have the period.” (Pt. 21, 30 years old)

Frequencies of menstrual app use were difficult to define for the interviewees. Many participants estimated to open their period app about five to eight times per month and many said to be using their apps more when ovulating or menstruating. One example is given by the following statement:

“On the days of the period I log more things [cycle-related symptoms], but the the other days, well maybe in the time of the fertile window or when I note that something has changed.” (Pt. 17, 31 years old)

Some period apps offer their users to digitally share their data with intimate partners, friends or healthcare professionals. Although none of the participants was using these features, several mentioned to discuss menstrual cycle ir/regularities with friends, to use the apps when talking to healthcare professionals, and to show their period apps and data to their intimate partners in the context of family planning:

“Yes, he [intimate partner] knows, he knows that my phone tells me when to remove it [contraceptive ring] and to insert it, because I'm

very forgetful so [laughter]. Yes, he is more involved than me.”
(Pt.19, 23 years old)

5.1.3 Everyday use

In the following, I describe the most popular features of menstrual apps and my interviewees’ main motivations and practices of app-supported period tracking. Moreover, some of the specificities of digital observation of menstruation as well as potential consequences are being addressed. Further, I present a brief section on changes in period tracking over time. Whereas this section can be understood as an overview of the most salient aspects of menstrual tracking via apps, the factors presented below are examined in more detail and from different perspectives in the subsequent chapters.

Popular features

Most menstrual apps offer a plethora of tracking categories that go well beyond the observation and analysis of period and ovulation dates. The most popular apps in this study provide users with up to thirty factors and several dozens of subcategories concerning emotional or corporeal states. The most prominent categories used by my participants were emotions (14), ovulation (14), pain (8), sexual activity (7), and vaginal discharge (3). Observation of libido, temperature changes, medication

intake, weight, food cravings, insomnia and physical exercise were mentioned by one or two participants each. For instance, one of the participants mentioned to enter several symptoms linked to premenstrual symptoms and sex life:

“Well, I think things like, like PMS [premenstrual syndrome] are exciting [to observe]. Um, I sometimes log emotions, but only if it’s noticeable. And yes, sex is also interesting of course.” – Interviewer: “Do you enter sex or libido? Because I think the app you are using offers both categories?” – Pt.: “Yes there is high libido and also if you have had safe sex or not, or [coitus] interruptus, I enter that too. And, um, I don’t check that regularly but if I notice that I have sticky [vaginal] discharge, then I log that too.” (Pt. 8, 36 years old)

Furthermore, some interviewees pointed out to have created tracking categories themselves, a feature several menstrual apps offer. However, participants usually said not to have used them over a longer period of time, as evident from the following extract:

“I have added some things [categories], but I didn't use them in the end. I am creating such great categories as “felt ovulation” [laughter].” (Pt. 1, 29 years old)

Menstrual Cycle Observation

In their most basic form, period apps can be understood as digital versions of menstrual paper calendars that allow for recording of menstrual cycle dates. In fact, the minimum input menstrual apps require in order to function properly is a continuous record of period dates. Hence, all of the participants of the study were logging their menstrual dates as highlighted by the statement below:

“Well for me the most relevant [feature] is menstruation, of course. Um, I enter when and how strong the bleeding is.” (Pt.1, 29 years old)

In contrast to non-digital forms of menstrual tracking, apps are constantly available on smartphones. This was appreciated by several of the participants who pointed out the risk of losing their period data when using other tracking methods:

“Um, yes, I think one of the motives was my interest in, in tracking and yes, because it’s easier [with a menstrual app], because I don’t lose it.” (Pt. 26, 27 years old)

The participants commonly mentioned more than one reason for tracking their menstrual cycles via apps. The most popular motivations were observing menstruation and ovulation (13), tracking of menstrual

cycle dates and cycle lengths (9), and preparing for future periods (8).

The latter is exemplified by the two following extracts:

“I use it often to check, um, when the next period is due. Especially when I have appointments, so that I know, when I am there, I'll take something with me [menstrual hygiene product] or I prepare emotionally.” (Pt. 1, 29 years old)

While the interviewee of the above extract states to “prepare emotionally” and in terms of provision of menstrual products, others used the apps’ prediction function of future periods in order to plan vacations, or to adapt their work schedule as evident from the following statement:

“I wanted to see for myself in which weeks better not to arrange an important appointment in the office, or a job interview, because it [cycle phase] simply makes a difference.” (Pt. 5, 37 years old)

Tracking of menstrual cycle dates and lengths was usually employed with the aim of confirming known or identifying suspected ir/regularities.

“Above all I use it [the menstrual app] to control when it [period] is supposed to be due, when it is due. I'm looking how much time it takes every month, to see if I am more or less regular” (Pt. 20, 23 years old)

In this context, the interviewees also stated to prefer apps over other forms of tracking as they were calculating future menstruation dates automatically:

“I am glad I've got it [menstrual app] because I know when it [next period] will be due more or less. I don't have to calculate anymore, the app tells me automatically when I open it, OK, well your next thing [period] will be on this date” (Pt. 6, 34 years old)

Health Tracking

Menstruation was commonly understood as an indicator for health. In specific, consistent durations of menstrual cycles were understood as an indicator for menstrual “normality” and good health, as indicated by the following statement:

“If you are menstruating it means you are healthy, doesn't it? If your body, that is, if you are regular, yes there is a health component there which indicates that things are going well. If you don't have it [menstruation] then there might be problems at the hormonal level, that is, it can be a health indicator that you are ok.” (Pt.14, 32 years old)

Observation of menstruation and ovulation in order to know more about their health status was highlighted frequently by the participants. A number of the interviewees stated to focus specifically on reproductive health. For instance, one participant pointed out to be charting basal

body temperatures with the aim of ensuring that they had restarted ovulating after stopping the contraceptive pill:

“I stopped taking the pill, after seven years of taking the pill. And then I wanted to know how my body works, after stopping the pill. And I think it [the app] is awesome for that.” (Pt.7, 28 years old)

Health tracking via period apps was not limited to physiological factors but also included the identification and analysis of mental health issues. One interviewee started app-supported period tracking encouraged by their therapist to observe correlations between their emotions and menstrual cycle phases:

“Well this anger [laughs], has had much to do with my period, but the depressive mood did not really, in my case did not really have something to do with it. So, it was revealing that I had found out which moods were connected to what.” (Pt. 4, 22 years old)

Getting to know bodies and menses

It was common that the interviewees underscored to be tracking their menses in order to know more about their bodies. Indeed, menstrual tracking via apps had an effect on the interviewees' awareness and knowledge regarding their menstrual cycles and associated factors. For example, one interviewee explained how the act of entering data into the period app enhanced their engagement with menstruation:

“Like that you have to actively enter something and thus, simply this, this activity that one carries out, yes, one thinks more about it, I believe. Otherwise it's just something that happens casually.” (Pt. 9, 32 years old)

Moreover, one participant pointed out that the apps' tracking categories support self-examination:

“I have started to pay more attention, and above all, exploring the app's options [tracking categories], I think they are good, they support self-exploration, for example the four options for the type of [menstrual] flow.” (Pt. 17, 31 years old)

Whereas period tracking via apps seemed to have helped some participants to refine their knowledge on menstrual cycles, others reported on insights concerning fundamental aspects of menstruation, such as their cycle and period lengths:

“Usually it is 28 and 30 [days], at least from what other people told me [laughs]. Um, and it was quite interesting that I've found out that I generally have 35 in between, and that it [menstruation] takes 7 or 8 days then.” (Pt. 4, 22 years old)

Another example was given by a participant who had previously thought that menstruation strictly followed the Gregorian calendar:

“Um, it has definitely changed my perception very much, um, only concerning menstruation, I had always thought that it is a month

later. Until I've realized that it's 28 days actually [laughter]. So, it's about basic stuff [laughter].” (Pt. 1, 29 years old)

With the aim of learning more about their cycles, participants engaged in tracking of a variety of menstrual cycle-related factors. In some cases, this led to the establishment of novel knowledge regarding the factors that can be associated with menstruation:

“For example, I didn't know that there were people who had had a certain appetite, for example, who wanted to sleep more, were sleepier, were craving for salty or sweet [food], I didn't know that, so yes I've learned that.” (Pt. 23, 21 years old)

Reassurance of menstrual cycle-associated feelings and sensations

Menstrual apps provided the participants with reassurance regarding menstrual cycle-related feelings, emotions or experiences. Several interviewees referred to their menstrual apps as a “reference point”:

“Yes, I am simply dealing with it more and um, I check on what day I am and how this affects me. So somehow as a reference point.” (Pt. 8, 36 years old)

Another example was given by an interviewee who stated that menstrual apps helped them to find explanations for their feelings and emotions:

“It is always relieving when you can look at it [the app] and go like:

“OK, now I know why I [feel] again like that.” (Pt. 4, 22 years old)

By reassuring participants of their experienced symptoms and emotions, app-supported menstrual tracking also appeared to compensate for the lack of recognition participants had received concerning their menstrual cycles as highlighted by the extract below:

“When I use it [the app] I feel - because it shows me a lot of symptoms that you can have - then I feel a little understood, so to say.” (Pt. 24, 18 years old)

Whereas app-supported period tracking often had a positive effect on their users’ experience of menstruation, some participants reported on negative outcomes. For instance, a number of interviewees reported on a negative impact when confronted with menstrual irregularities by their apps:

“I will never forget the day when it [menstruation] was 18 days late according to what the app told me. It wasn't the fault of the app but the fault of my body, but because also we had exams and the stress.” (Pt. 19, 23 years old)

Others pointed out that app-supported tracking had a calming effect as they were able to identify patterns of regularity within the irregularities they were experiencing:

“Until then [using the app] I actually didn't know if I am super irregular

or if it's not so bad. I always thought I was super irregular. Since I got the app, I've found out that it actually isn't that irregular, so, every couple of months it's very late.” (Pt.5, 37 years old)

Contraception and conception

Period apps offer users to predict their ovulatory dates and hence fertile windows. However, the vast majority of the heterosexual participants did not rely on menstrual apps' calculations of fertile phases for contraception. Most of them said that they did not trust their apps, and often menstrual cycle irregularities were mentioned as a reason for not being able to use period apps as a contraceptive:

Interviewer: “OK, so you don't use the app for knowing your fertile days, right?” - Interviewee: “The application? No, because I have a very long period [cycle] of 40 days or it comes very late, I am very irregular, so I could never rely on something like that.” (Pt. 25, 29 years old)

Nevertheless, there were few interviewees who reported that they were using menstrual apps as “a kind of contraceptive method” as pointed out by a participant of the below extract:

“And also, um, as a kind of contraceptive method (...) I am not planning to have another child right now, but if it should happen it's ok, I am not taking the pill, we are not using condoms either (...) on the days where I am potentially fertile we do something else, not

penetration.” (Pt. 15, 32 years old)

Others reported on using the app in combination with additional measures:

“Well, probably [I have it] on my mind when are the fertile days, when are the not fertile days, this yes, but not that I'd use it exclusively.”
(Pt. 5, 37 years old)

Moreover, there was one participant who stated to use the app as a single contraceptive, and one interviewee pointed out to be using to period apps with the aim of getting pregnant:

“I am observing all of that because, as I've already told you, I am trying to have another baby, and like that I am way more involved in the whole process, in the whole menstrual cycle.” (Pt.18, 40 years old)

Interaction with healthcare professionals

Several of the participants pointed out that they were using period apps not solely as instruments for personal observation and analysis of menstrual cycles and associated factors, but also with the aim of informing their healthcare professionals. A commonly mentioned practice was checking the starting dates of current cycles prior to or during gynaecologic visits. Moreover, some participants tracked their periods to facilitate interactions with healthcare providers. For instance, a participant who had suffered from a severe illness in the past, stated

to use the app to monitor cycle regularities which served as an indicator for correct medication doses. In the extract below they highlight how app-supported period tracking facilitates the communication with doctors:

“I was diagnosed with thyroid cancer in 2013 ... and I need the information, how long [will it take to the next period], how long is the whole [cycle], especially so that I have this information for the doctors. (...) ‘Every six months, I have to go to a control and they [doctors] ask: ‘How is it [menstruation] going?’, because of the hormones and the dosage [of medication] ... and then I can show it [past menstruation dates and cycle lengths] to them, because it is stored [in the app] for a certain time. Because it was impractical with a [paper] calendar – they look at the calendar but then they ask ‘is it regular?’, and with the app I can say ‘there you have all [the data]’ and that's it” (Pt. 6, 34 years old)

Another participant, who was prescribed hormonal contraception in order to reduce strong and painful menstruations, pointed out to use the menstrual app in order to provide physicians with exact period dates:

“I use it to know, to enter when exactly the [period] was, because I am taking the pill, so at the doctor I need to tell him exactly the days I have it and it's for controlling that, for knowing when I had it, and to see if it comes regularly or not.” (Pt. 13, 18 years old)

Future Plans, closure and (partial) leaving

As users' needs change over time, so does their use of period apps. In the interviews, most of the participants reported on transformations regarding the categories they were tracking. Some interviewees planned to observe more factors or collect more exact in the future:

“I have always thought that I am very irregular but actually I'm quite regular, whereas, um, and I want to have a closer look at that, so I have to collect a few more data.” (Pt.9, 32 years old)

However, the majority of the interviewees noted a decline in the categories they were tracking over time. This was mainly due to changing life circumstances or occurred when participants felt they no longer needed the apps in order to observe their menses, bodies and experiences:

“Well, in the beginning I entered, well you do have the possibility to chart certain emotions. And I used to do that in the beginning. And then I found out that I am in a good mood when ovulating. And that I am in a bad mood the days before the period. I entered that in the beginning until I recognized the rhythm myself, now I don't have to enter it anymore.” (Pt.7, 28 years old)

The study also included three participants who had stopped tracking their menstrual cycles via apps prior to the interviews. While one

interviewee mentioned having stopped due to amenorrhea (absence of period), the other two users raised privacy issues and pointed out not to be willing to engage in the amount of work required when using menstrual apps:

“Because one needs at least 15 minutes a day to enter everything [into the menstrual app], because one has to read a lot. And then to estimate the severity of one's symptoms, this requires quite a lot of time (...) it was also strange, because, I mean it is quite intimate (...) and I think it is quite weird that you have to enter that into the internet again. This for sure played a role in stopping it.” (Pt.11, 28 years old)

5.1.4 Additional methods of menstrual tracking

Seven participants reported to have been observing their menstrual cycles before engaging in app-supported period tracking: six had been using a paper calendar and one interviewee stated to have been using a circular moon calendar which allowed for tracking mood swings and was based on the assumption that menstrual cycles are influenced by moon phases, seasons and other recurring events in nature:

“In this calendar you enter your mood (...) it's like a [menstrual] app on paper, but with the philosophy of, you know, connection to the earth, femininity, that everything is circular. (Pt. 21, 30 years old)

One of the ex-users stated to have replaced app-supported tracking by relying on friends' information on their period dates:

“Some of my friends have their period at the same time, and then I ask: when are you due? Alright, I'll be due then as well. That's a better calendar, I would say [laughter].” (Pt. 11, 28 years old)

Also when tracking their cycles via menstrual apps, a number of participants stated to engage in additional practices: two were relying on friends' cycle dates in order to predict upcoming periods, one was writing a period diary and another interviewee planned to do so, and four were reading period blogs or books about menstruation and menstrual health as pointed out below:

“I have just read a book, its name is “the cycle strategy”, do you know it? Um, a paperback, it describes the influence of the hormones and I could identify with many of the themes. I wanted to find out, um, how it [menstrual cycle] affects me. When I shouldn't arrange an important appointment in the office, or a job interview or, because it really makes a difference. I wanted to track a little how productive I am, how much sleep I need, because I really feel a difference over the course of a month.” (Pt. 5, 37 years old)

Moreover, one of the participants used a note-taking app in order to have an additional record of their menstrual cycle dates.

5.2 Medicalisation of menses and bodies

Menstruation and related symptoms have received significant medical attention from the beginnings of Western medicine thus rendering menses a prime example of the medicalisation of women's bodies and the transformation of sexual difference into disease. Biomedical inventions and technological developments play an important role in the shaping of processes of medicalisation (Clarke et al., 2003). Menstrual apps represent one of the most recent technologies to observe periods and related symptoms. In the present chapter I present how the use of apps for period tracking contributes to, questions, and alters processes of medicalisation of menstruation and associated symptoms. The chapter is divided into 3 subthemes: 1) app-supported menstrual tracking as a means to control periods and bodies 2) shifts in the interaction with healthcare professionals through the use of period apps, and 3) app-supported menstrual tracking as health tracking.

5.2.1 Controlling Menses

As highlighted by Elizabeth Grosz, women's bodies have been conceptualized as “an uncontrollable flow in Western culture, a permeable boundary that leaks and bleeds” (Woods, 2013: 271). This perception seems to be valid also today as the uncontrollability of

menstruation and associated symptoms was frequently mentioned in the interviews:

“And always when I have especially intense backpain and I can’t concentrate on anything because everything hurts, and simply everything, everything, everything is, the hormones are completely out of control, so everything makes me angry and everything makes me sad, and nothing, well I simply hate it, I get really angry about it [menstruation].” (Pt. 10, 18 years old)

Talking about the symptoms the participant experiences during their menstrual cycle, they note that “the hormones are completely out of control” leading to intense emotions such as sadness and anger. It seems that not being in control of their moods increases the interviewee’s anger which they direct towards their body and menses. Further, they also mention to suffer from corporeal side effects such as severe pain impeding their everyday life as they “can’t concentrate on anything because everything hurts”. Elsewhere in the interview, the same participant specifies the everyday life restrictions imposed by their menstrual symptoms every month:

“that means that every month, for about five to seven days, especially in the summer, I can’t go swimming, or I can’t do the things because it’s simply not comfortable.” (Pt. 10, 18 years old)

Limitations in everyday activities due to periods were highlighted by several of the interviewees, making them feel not to be able to fully control their bodies and lives. Against this background, apps for tracking of menstrual cycles appeared to be a useful instrument for being in better control of menses. This especially concerned the improvement of the predictability of future periods, as exemplified by the following extract:

“I like it [menstrual app] to know, to be in control and see, know how much time it is late, and to be able to calculate more or less when it will be due.” (Pt. 25, 29 years old)

As mentioned in the preceding chapter, being in better control of menstrual dates was important for many of the interviewees and represented one of the major reasons to use an app for menstrual tracking. Tracking of menstrual dates was particularly appreciated by participants suffering from strong menstrual symptoms such as physical pain and intense mood swings as well as by users experiencing irregular cycles as highlighted by the latter statement as well as the following extract:

“Well I was using it [menstrual app] because I have never, never been aware of when the period will start. Actually, I’m irregular and so I had it for some time, maybe only for three months, a bit for

keeping track when it starts, when it doesn't (...) to be a bit in control of, of the period, because sometimes I have been two months without, or I had it twice a month, every fifteen days, so I wanted to know a bit what my normal cycle looked like." (Pt.16, 32 years old)

Being in control of menstrual dates helped the interviewees to prepare accordingly as underscored by the same interviewee:

"And if for example I have some event that coincides [with menstruation], I am putting on different clothes, these kinds of things." (Pt. 25, 29 years old)

As evident from the extract, menstrual apps can be used to engage in activities of menstrual concealment. One of those practices - putting on different clothes - is mentioned here, presumably with the aim of hiding potential leaks or menstrual products that might be visible through tight clothing or bright outfits.

Although it might seem that controlling menstrual dates via apps supports the hiding and thus tabooization of periods, many interviewees experienced app-supported period tracking as positive. Besides being able to better prepare for upcoming periods, menstrual apps also helped users to bring order and calm down:

"It's like that that I can have a little more order with the application.

Yes, it gives me peace of mind to have more order, I don't worry as much as I know that it [period] might be due in the next days, for that it is helpful. (...) It's a way to have a bit of control and not to be so lost, because I used to be lost." (Pt. 21, 30 years old)

Observation and control of menstrual cycles via apps do not necessarily need to have negative effects on users. Rather, being in better control of one's cycles can be empowering as illustrated by several of the participants' statements presented so far.

In addition, menstrual tracking via apps was perceived as an alternative to the regulation of menstruation via hormonal contraceptives. For instance, the participant of the following extract noted that they have started tracking their periods with menstrual apps after stopping the pill:

"I wanted to have it [menstrual app] because I had stopped taking the pill. And then I didn't have my period for a very long time. Probably eight to nine months [clears throat]. And then I wanted, well afterwards when it was regular again, well, of course it wasn't that regular. Not very irregular, but for me it was a whole new situation not to know exactly when it starts." (Pt. 1, 29 years old)

As evident from the extract, menstrual apps can represent an alternative to be in better control of period dates for participants who were used to regular bleedings due to the intake of hormonal contraceptives. In the same context, the interviewee of the above statement mentioned to have

stopped the pill in order to “feel the body how it really is” and retrospectively says to regret having taken the pill as they “didn’t have to fill themselves with stuff”. Hence, app-supported menstrual observation was perceived as supporting a ‘healthier’ or more ‘natural’ way of tracking one’s cycle.

However, there were also a few participants who stopped using their menstrual app because they started using hormonal contraception:

“I use, well, I used to use [a menstrual app], because I had um, I had a very irregular period, so I used the one with a kitten. What’s the name? ‘My period’? [refers to menstrual app] ‘My calendar’ or something like that, the famous one, the one everybody is using, because it calculated more or less my irregularities and told me relatively well when it was due, but then I started to use a contraceptive that controlled my period and now I know it’s every three weeks, so I don’t need anything to predict [the start of the period].” (Pt. 19, 23 years old)

Later in the interview, the participant highlighted regulation of menstruation as the main reason for having started using hormonal contraception:

Interviewer: “So, you are using the [contraceptive] ring for that purpose, for –“ Pt.: “For regulating, above all for regulating, because I was having a hard time with the period, and now with my boyfriend, and it was a lot of suffering, because the day it

[menstruation] was late, I will never forget the day when it was 18 days late according to what the app told me. It wasn't the fault of the app but the fault of my body, but ... because also we had exams and the stress.” (Pt. 19, 23 years old)

Here, the interviewee notes that they experienced discrepancies between their menstrual app's calculations and actual period dates as a memorable, if not traumatic event. Indeed, although not specifically addressed by the interviewee, it seems that their menstrual app's visualization of irregular cycles played a role in their decision to “regulate” their menses through the use of the contraceptive ring.

The interviewees did not always decide for either the app or hormonal contraception. For instance, the participant of the above statement mentioned to be using an app that reminded them when to insert or remove the contraceptive ring. Another participants highlighted to be using a period app in order to track whether their cycle had become regular by intake of the contraceptive pill:

“I use it to know, to enter when exactly the [bleeding] was, because I am taking the pill, so at the doctor I need to tell him exactly the days I have had it and it's for controlling that, for knowing when I had it, and to see if it comes regularly or not.” (Pt. 13, 18 years old)

As evident here, app-supported period tracking was also used to provide healthcare professionals with menstrual data. In this specific case, it was the participant's doctor who required them to track the regularity of their bleeding in order to control the effectiveness of the contraceptive pill. The role of menstrual apps in the interaction with healthcare professionals is discussed in more detail in the subsequent section.

5.2.2 Interaction with healthcare professionals

Logging of menstrual dates and associated symptoms facilitated the interaction with healthcare professionals for several of the participants of the study. A similar example as the one given at the end of the preceding subchapter was provided by an interviewee who had suffered from a severe illness in the past. The participant was tracking their menstrual dates as an indicator of correct medication dosages:

“Every six months, I have to go to a control and they [doctors] ask:

“How is it [menstruation] going?”, because of the hormones and the dosage [of medication] ... and then I can show it [past menstruation dates and cycle lengths] to them, because it is stored [in the app] for a certain time. Because it was impractical with a [paper] calendar – they look at the calendar but then they ask: “is it regular?”, and with the app I can say “there you have all [the

data]” and that's it.” (Pt. 6, 34 years old)

As pointed out by the participant, the use of the menstrual app experienced as more helpful than period tracking via a paper calendar as it provided a direct overview of menstrual regularities and lengths.

Whereas the participants of the two latter statements were urged to track menstrual dates, one of the interviewees told me that their therapist recommended to observe their moods in the course of the menstrual cycle. The recommendation followed an inconclusive blood test for thyroid problems and aimed to support the decision of the subscription of antidepressants:

“and she [therapist] said: “OK, now have a look on, on how’s your mood, if it’s connected to your period, if it’s the hormones, or if it’s connected to the thyroid” (Pt.4, 22 years old)

At the time of the interview, the participant was not yet able to draw any useful conclusions regarding the connection between moods and their menstrual cycle. Still, it is interesting that app-supported tracking might facilitate the diagnosing and treatment of mental health issues. Several of the interviewees reported to be looking at the data recorded on their apps prior or during doctor appointments. Given that

gynaecologists usually ask for the first day of the current menstrual cycle, a number of participants mentioned to be checking menstrual dates. One example was given by a participant who stated to have a look at cycle dates as well as their average cycle length during gynaecological visits:

Interviewer: “Does the [menstrual] app play a role in the interaction with your gynaecologist?” Pt.: “I think it [menstrual app] is useful to have a look when my last day of the [previous] cycle was. And in order to see how long the cycle usually is, yes.” (Pt. 8, 36 years old)

The participant who had experienced a severe illness in the past highlighted to discuss logged menstrual symptoms with their gynaecologist:

“It is important to me [to record menstruation], because, um, one can discuss it with the gynaecologist, she asks and says “yes, that’s normal”. It’s simply like that, that one has tensional pain in the breast or elsewhere, that the back hurts, or whatever, that one is in pain two, three days before the period starts.” (Pt.6, 34 years old)

Here it seems that tracking of menstruation and associated symptoms helps the interviewee to improve the communication with their doctor and to ensure that the experienced pain was “normal”. They mention that menstrual tracking is important to them and the doctor’s

reassurance of the normality of their symptoms seemed to calm them down. It is likely that the sharing of data in addition to records of menstrual dates is a result of the participants' medical history. Indeed, it appears that period tracking via apps provides both, the participant and their doctor with more detailed data on the menstrual cycle.

Although several of the interviewees pointed out that their doctors recommended tracking of menstrual cycles, none of the healthcare specialists specified the use of an app. One interviewee pointed out that the interaction with their doctor motivated them to use a menstrual app to be better informed about their menstrual cycle:

“I simply wanted to see how, well, because one is at the doctor and he asks on which day of the cycle you are and I never had a clue [laughter]. Then I was, I wanted to track it a bit.” (Pt. 5, 37 years old)

Some of the period apps used by my interviewees offer the feature to share the collected data with others such as healthcare professionals, as highlighted by one of the participants:

“It [menstrual app] is cool because I think you can make a backup copy [of the recorded data] and stuff, you can even send it to your gynaecologist.” (Pt. 19, 23 years old)

As most of the participants did not know that their apps provided a sharing function, I asked them if they were interested in such a feature. The majority responded positively, as exemplified by the following extract:

Interviewer: “Would you be interested in forwarding your menstrual data to your gynaecologist?” Pt.: “Yes, why not? I wouldn’t have a problem, no concerns, I’d rather find that extremely useful, because it [period] happens once a month, and it has to be precise, the first day and the rest goes automatically, that would give him [gynaecologist] a good idea, yes.” (Pt. 5, 37 years old)

As mentioned here, the collection of menstrual data via apps was perceived as advantageous because it was understood as a more precise as well as easy-to-handle recording technique given the automatization of the logging process.

While most participants were in favor of sharing menstrual datasets with their physicians, a number of interviewees expressed to be concerned. For example, the extract below is a good illustration of the privacy concerns some of the participants described:

Interviewer: “Does the [menstrual] app you are using offer the possibility to send your data to another person, for example your gynaecologist?” Pt.: “No, no, let’s see, I don’t think so, and even if, if I had seen ‘share’ I would have shared it in Face [Facebook]

[laughter] – just a joke, it’s a joke, I don’t think it [the app] has this option, but even if it had it I wouldn’t feel the need either.” (Pt. 26, 27 years old)

Here, by cynically considering uploading their menstrual data on a social media platform, the interviewee of the above extract expresses their disapproval of data sharing practices. Another participant who disapproved the sharing of menstrual data with their doctors said to prefer to “simply tell them personally” because they assumed it was not necessary to provide “all the information”:

“I think for me it would be enough to simply tell them [gynaecologist] personally, but um, I am not sure I would like that so much. I have never thought about it. Probably it is more – well, I mean I can describe myself how regular I am [laughter] or whatever. So, I don’t think it’s necessary that he has all the information about my menstruation, I think [laughter]. It wouldn’t bother me a lot, but I am not sure it’s necessary.” (Pt. 9, 32 years old)

One of the participants reflected upon how different life situations might influence users’ benefits of forwarding menstrual data to their physicians. In the below extract, they describe potential differences in data sharing practices depending on the user’s (reproductive) health situation:

“When I go [to the gynaecologist] they ask me the date, they always

ask you the date of the last period and I look it up there [on the menstrual app] and I tell them. But I have never had any pathology, maybe when you are trying to get pregnant or you are taking, if you are in some kind of treatment, well maybe in this case it [menstrual data sharing] is more useful, but as I haven't had any problem, I just go to the annual controls, so no, it wasn't necessary." (Pt. 15, 32 years old)

Although not affected personally, the participant highlights the potential usefulness of period data sharing with gynaecologists for users suffering from menstrual cycle-associated pathologies or fertility problems. This relates to the statement above of the interviewee who used their menstrual app in order to control medication dosages together with their doctors.

5.2.3 Tracking health

Menstruation and associated symptoms were commonly perceived as health indicators. Menstrual cycle regularity was often understood to be an indicator for good reproductive and/ or overall health, as exemplified by the following extracts:

“Well I think that a healthy body should be menstruating regularly in the best case [laughter], otherwise there is a problem, yes I think that's directly connected.” (Pt. 9, 32 years old)

“It’s a way of knowing that your body is ok, and that you, I don’t know how to explain it, to know that your body is fine, that it is healthy, that you have your cycle every month and if not, then because something has happened.” (Pt. 24, 18 years old)

Another participant pointed out that their period was a sign that “everything works relatively ok, [that] everything is relatively healthy down there”:

“I think, yes, I’m on it [period], so everything works relatively ok, everything is relatively healthy down there. And I am glad that it is that way.” (Pt. 10, 18 years old)

Besides menstrual cycle regularity, several of the interviewees understood menstrual cycle-related symptoms as indicators for health and healthy lifestyle:

“because of PMS [premenstrual syndrome] and so, so it's kind of a feedback from my body ... when I get PMS ... then it is for me, I'd say the price I have to pay for the previous month, that sounds a bit harsh, but [it is] a kind of feedback from the body, um, that I have ignored myself or, um, yes, that I haven't paid attention to myself.” (Pt.8, 36 yrs.).

Whereas the participants of the extracts above focused on overall health, some interviewees highlighted to also track their reproductive health via period apps:

“Because I am thinking of, of having children, not yet, but because of the health, as I've had also ovarian cysts because of, because of not having the period regularly, so for, for controlling a bit the menstruation, because sometimes I've been two months without, without having my menstruation, or one month it came two months in a row, every 15 days, so I wanted to know a bit what my normal cycle was like now.” (Pt. 16, 32 years old)

Taking into account that the interviewee of the above statement identified as a lesbian, it becomes apparent that fertility tracking via menstrual apps does not have to be an exclusively heterosexual practice. Although menstrual apps' calculations of fertile windows might not be relevant for people engaging in homosexual relationships in terms of contraception, observation of menstrual cycle durations can play an important role for users of all sexual orientations regarding reproductive health tracking.

Although menses were largely perceived as health indicators and – as evident from the preceding section – as requiring medical consultation, the majority of the participants did not understand the information and calculations provided by period apps as health information. Besides offering users to predict their upcoming periods, record their menstrual histories and display statistics of average cycle lengths and changes in

related symptoms, some of the apps used by the participants of my study also provide further information via pop-up messages or fora. However, when I asked the interviewees whether their apps were facilitating medical information, they usually negated:

Interviewer: “Does the app provide medical information?” Pt.: “Medical? No. The two applications I have, um, never send me information, not one of them, for example, neither the ‘Menstrual Calendar’ nor ‘Clue’ [app names] send me information via e-mail, that means, I just log my information and I don’t receive any answer of none of the two applications, and I like that, that they don’t bombard me neither with advertising nor with information I am not interested in.” (Pt. 18, 40 years old)

A similar statement was made by another participant:

Pt.: “I don’t need any health advice” – Interviewer: “And your app doesn’t offer that?” Pt.: “No, not that I know, I have never seen anything like that, and I didn’t deactivate it either.” (Pt. 1, 29 years old)

As evident from the two extracts above, most of the participants did not understand menstrual apps as providers of health information, neither did they express a desire for such a feature. On the contrary, by stating that they do not want to be “bombard[ed] neither with advertising nor with [health-related] information”, the interviewee of the former extract

compares the provision of medical information via apps with undesired adverts.

One participant did mention some of their menstrual app's features when asked about the provision of medical information, but understood them as of minor importance:

Interviewer: "Does the app provide medical information?" Pt.: "Medical?" Interviewer: "Yes, like more general information on menstruation" Pt.: "No, I think it had nothing but weight, it generated a graph, and it made you the [graph] of your period, no? I mean the length of your [average cycle], what is it called, what I do remember are symptoms, if you were sad, if you were I don't know, things like that but that's it. Maybe it had more [information] and I didn't explore it, don't know." (Pt. 16, 32 years old)

A similar statement was made by another interviewee who did not appear to consider menstrual cycle-associated information as relevant medical information either:

Interviewer: "Does your app offer you medical information?" Pt.: "No, I think it tells you a bit about menstruation, but not something very specific." (Pt. 17, 31 years old)

In the same context, the participants were also asked if they were using or had been using other health apps. While a number of interviewees

reported on the use of fitness or health apps (, several rejected the use of any health apps. For instance, in the following extract the interviewee underscores the intimacy of health data and expresses concerns regarding the unwanted sharing and processing of their health data:

Interviewer: “Do you use any health apps?” Pt.: “No, there are some installed [on the smartphone] and I sometimes have a look but I don’t really use them. I think it’s weird, um, to use apps to check one’s health. I find it strange because one enters quite personal information. Like weight and – well it doesn’t matter that much – but it’s still weird to be using them and to record [data] on a platform where people have access to.” (Pt. 11, 28 years old)

The extract echoes the concern of privacy violations mentioned by the participant cited above who cynically mentioned to be sharing their menstrual data on social media platforms. However, the interviewee of the latter extract specifically refers to health apps, seemingly not considering period apps part of this group of apps. The participants’ experiences of and responses to issues of privacy and surveillance are discussed in more detail in the respective chapter.

In contrast to the examples presented so far, one of my interviewees did raise concerns regarding the provision of health information via menstrual apps:

Pt.: “I am using the app to see if it [period] regular and that, but I don’t start examining anything.” -Interviewee: “Why not?” - Pt.: “I prefer to go to the gynaecologist and to talk to a doctor before trusting in what an app is telling me.” (Pt. 13, 18 years old)

As evident here, the interviewee raises concerns regarding the trustworthiness of their period app as they state to “prefer to go to the gynaecologist and to talk to a doctor”.

Menstrual apps provide users with the possibility to track a variety of menstrual cycle-related sensations and emotions. As discussed above, app-supported menstrual tracking can improve users’ awareness of and knowledge on menstrual cycles, as well as provide reassurance of related symptoms. On the other hand, however, observation of periods via apps can also lead to increased levels of stress and strengthen the association of menstruation with symptoms that are commonly perceived as negative such as mood swings and pain:

Interviewer: “What are the functions [of the menstrual app] that you are using?” – Pt.: “Well so far I have adjusted all these settings, how long my cycle is, that I know, that it shows me where I am at. I

mean, if I am shortly before the period and um, during the period one can enter how one feels, what one is suffering from this time, headache, excruciating pain in the abdominal area or backpain or things like that. And I also use it because, um, [to log] which kind of medication I have taken against the pain.” (Pt. 10, 18 years old)

When asked about the functions they use, several kinds of pain are mentioned by the interviewee. The expression “what one is suffering from this time” points to the perception of periods as an inevitably painful process. The following example was given by a participant who stopped tracking their period due to amenorrhea (absence of period) and echoes the general understanding of menstruation as dolorous:

“It [menstrual app] used to ask me, for example, if I was taking contraceptives, if I had pain, but well, I have never been a person that suffers from menstrual pain, I am lucky [laughter].” (Pt. 23, 21 years old)

Remembering pain as a major feature of the menstrual app they had been using, the participant of the above statement considers themselves “lucky” as they had never experienced painful periods. Hence, the experience of periods free of pain was not seen as usual but rather as a stroke of good fortune. Both of the extracts above indicate that app-supported period tracking participates in the reinforcement as well as

the normalization of the perception of menstrual cycles as painful and debilitating. In the former extract, this is enabled not only through menstrual apps' tracking categories for pain but also expands to related practices such through features such as the possibility to enter the intake of analgesics.

Whereas most participants did not seem to pay much attention to changes in their perception of menses through app-supported tracking, some did reflect upon potential consequences of entering symptoms into their period apps. For instance, one interviewee pointed out a higher likelihood to associate certain sensations with menstruation:

“It [period tracking] is definitely very useful for me and it is also, um, one doesn't know whether it is one's [own] perception or whether it [app-supported tracking] has an influence, because of course I easily identify PMS [premenstrual syndrome] as such [smirks]. Um, and sometimes I look at the [menstrual] calendar and it's a long, long time until it [period] is due [laughter], but sometimes it fits.” (Pt.1, 29 years old)

In the above extract, the participant contemplates the possibility that menstrual tracking has had an impact upon their perception of their body. It is noteworthy here that the interviewee notes to tend to associate feelings and experiences with their menstrual cycle even

before looking at the app. Further, it seems that it was the mismatch between experienced symptoms and app-provided menstrual dates that led to increased awareness of changes in perception of menses due to app-supported tracking. The (conceptual) transformation of bodies through period tracking will be discussed in more detail in the subsequent chapter.

5.3 Transformations of bodies through app-supported menstrual tracking

Drawing on the user interviews as well as the autoethnography, the aim here is to explore how app-supported menstrual tracking affects users' bodies and selves. The chapter is divided into two main parts: in the first part, I examine how period tracking via apps leads to changes in the experience and understanding of bodies and selves. In the second part, I explore the kinds of interconnections that are established between people, apps and digital data during period tracking.

5.3.1 Shifts in the understanding and experience of menses and bodies

As highlighted in the introductory chapter, menstrual tracking per se is not a novel development but builds upon a long history of observation of menstrual cycles and fertility. Nevertheless, there are important differences between non-digital forms of period tracking and app-supported monitoring of menstrual cycles. These differences affect users' practices and lead to changes in people's experiences and understanding of their bodies, menses and selves, as confirmed by most of the participants of the study, and highlighted by the following statement for instance:

“Yes, this thinking about how I perceive myself, how I perceive my feelings, my body as well, that has changed for sure.” (Pt. 1, 29 years old)

In the following, I will present the major specificities of digitized menstrual tracking and their consequences as experienced by the study’s participants and myself during the autoethnography.

Expansion of time and place

One of the most striking differences compared to former ways of menstrual tracking is period apps’ constant availability. Given that smartphones have become faithful companions in our everyday lives, apps – such as those for menstrual tracking – can be accessed by their users at almost any given time and location. The continuous availability of period apps was often mentioned by the interviewees as one of the main advantages over other forms of menstrual tracking:

“it [the menstrual app] is more convenient than a [paper] calendar, because my phone is with me all the time” (Pt. 2, 30 years old)

Whereas the ubiquity of menstrual apps might be convenient, the resulting expansion of the temporal and spatial scope of period tracking influences how menstruating bodies and selves are being perceived, potentially turning menses into projects that require constant

monitoring. One example of the frequent use of menstrual apps is given by the extract below:

“Now and then, occasionally, when I don’t know where I am in my cycle. I open it [menstrual app] for sure twice a week, simply to have a look. Because I don’t remember well. And when you’re late then they send you a notification, a pop-up message. I think it also warns you against PMS [premenstrual syndrome].” (Pt. 5, 37 years old)

Here it seems that through sending pop-up messages, period apps actively remind their users of their cycles, thus increasing the impetus for constant monitoring. Further, many of the apps’ features are directed towards the future (prediction of future periods, ovulation dates or upcoming symptoms such as premenstrual syndrome), as highlighted in the following statement:

Interviewer [referring to menstrual app]: “What are those clouds?” – Pt.: “They represent the days before your period, your mood” – interviewer: “OK, and how does the app know how you feel before [the period]?” – Pt.: “Because I already had a period with, it was about three days before the start of the period that I had a headache and so on, so the app assumes that this will happen again.” (Pt. 13, 18 years old)

Menstrual apps' predictive functions such as the prognosis of premenstrual symptoms as mentioned in the above statement seemed to influence how users experience their menstrual cycles and bodies, i.e. as future-oriented, foreseeable events, linked to pain and bad mood. In fact, menstrual tracking via apps was understood as an anticipatory project by several of my participants. An example is presented below, by one of the interviewees who mentioned a desire for tracking more data with the aim of knowing more and better:

“I have always thought that I am very irregular but actually I'm quite regular, whereas, um, and I want to have a closer look at that, so I have to collect a few more data.” (Pt. 9, 32 years old)

Besides predicting future period dates and cycle-associated symptoms, menstrual apps also provide users with past period dates and data on previously experienced cycle-related symptoms, as well as with statistics and illustrations of average cycle lengths. The availability of data on past menstrual cycles had an impact on the interviewees' perception of their menstrual histories, especially when they were confronted with unexpected discrepancies when comparing the information saved by the apps with their memories. For instance, one

of the participants voiced a conflict between expected and actual cycle lengths as they went through their apps' records during the interview:

“Well, when the period starts then I press here [points on the 'period has started' button on the app], or I can also enter it later, um, and then the average cycle is being calculated – look [showing me past cycle lengths on their smartphone] I have been lying to you, there it was 31 days, and usually it's 27, 28, oh, there it was less – funny, well, you see? You see, I remember something and it's not really accurate ... like I've said before, 28, 29 days, always regular, but it's not true, and when my cycle was very short, this was an emotionally challenging situation.” (Pt. 5, 37 years old)

As highlighted here, most participants confronted with discrepancies were more likely to trust in their apps' recordings than their own memories. Thus, given all the information they record, menstrual apps seem to serve as a kind of digital memory for menstrual histories. Whereas some interviewees of my study were disconcerted when confronted with differences between their own memories and the apps' records, most participants appreciated the stability of the menstrual records provided by period apps. In fact, several participants mentioned to have turned to apps precisely because they feared losing their recordings when using other tracking methods:

“I used to lose the paper [calendar], and with the application I haven't

lost my data in more than a year.” (Pt. 26, 27 years old)

Expansion of range and depth

Next to the expansion of temporal and spatial aspects of menstrual monitoring, period apps are also likely to broaden its range and depth as they provide users with a plethora of categories that can be tracked, analysed and set in relation to menstrual cycles. During app-supported observation of menstrual cycles, users are encouraged to enter intimate physical, emotional and behavioural data such as pain, mood swings and libido. Comparing period apps to former ways of menstrual tracking, one of the participants pointedly described app-supported tracking as an “extension” of what they used to do before:

“I have always recorded the date of menstruation because my Mum used to do it as well, I was controlling that, yes, with a paper calendar (...) here [refers to menstrual app] it says that it was in 2012 [start of menstrual tracking via app], but I am not sure, can be that I have used it before, I don’t remember, it was something logical. I don’t know, like an extension of what I used to do on paper before, right?” (Pt. 15, 32 years old).

For several interviewees, the expansion of tracking categories led to the association of a range of factors with menstrual cycles which they had not related before, as demonstrated by the following statement:

“Well, I didn't know all the symptoms one could have [laughs]. ... I think, I found out that I hadn't related some of the symptoms I had at this time to my period. Because I simply thought, things like I don't know, diarrhea or something like that, I thought that I had eaten something bad, but then, when the app told me then, that one can get that also from the period basically, or headache, or ... anything. That, yes, that was maybe, that gave me, I have dealt a bit more with it, yes.” (Pt. 11, 28 years old)

Hence, the participants seemed to profit from tracking additional factors as it helped them increase their knowledge on and awareness of menstruation. On the other hand, however, users might be tempted to relate all kinds of symptoms to menstrual cycles and thus run the risk of overlooking other causes.

Menses and bodies as manageable projects

During app-supported period tracking, users are provided with instantaneous visualizations of their cycles and related symptoms, as highlighted in the following statement:

“I can immediately see the fertile phase as well as the menstrual phase”
(Pt. 1, 29 years old)

What emerges from this statement besides the immediacy of the displayed information is the importance of the visual during period

tracking. In fact, it seemed that continuous recording and visualization made menses and related symptoms more trustworthy. One example was given by a participant who compared their apps' depictions with their bodily sensations to verify the truthfulness of their experience of changes in cycle-related symptoms over time:

“Well, I've entered discomforts also. Because I was interested in whether I just saw it that way or whether it really changes.” (Pt. 11, 28 years old)

“[W]hether it really changes” points to the belief that the app's recordings are more trustworthy than the participant's experiences. Whereas the not all interviewees seemed to prioritize their apps' visualizations, seeing their data did play an important role in verifying their sensations and experiences:

“Well, then I use it, I enter to more or less see the, the ovulation, if it matches because I more or less know what [symptoms] I have, if my belly hurts or whatever, so I enter it to reinforce it, right? And like that I can see it better.” (Pt. 15, 32 years old)

For many of the participants, the increase of the visibility of menstrual irregularities and symptoms via period apps appeared to strengthen the imperative to assume the responsibility and to react correspondingly. Self-responsibility was a recurring theme in the interviews. For

example, one interviewee understood menstrual cycle-associated symptoms as feedback from their body regarding their lifestyle:

”because of PMS [premenstrual syndrome] and so, so it's kind of a feedback from my body ... when I get PMS ... then it is for me, I'd say the price I have to pay for the previous month, that sounds a bit harsh, but [it is] a kind of feedback from the body, um, that I have ignored myself or, um, yes, that I haven't paid attention to myself. And, yes, just to, um, it makes me think, it prompts me to think about what I could do differently.” (Pt.8, 36 yrs.)

As evident here, changes in lifestyle were often considered to represent a way to achieve more regular periods and/ or less painful cycles. Thus, for some of the participants, menstrual apps appeared to act as triggers for changes in behaviour with the aim of improving cycle-related symptoms or irregular cycles.

Defining and abstracting menses and bodies

Objectivity represents another fundamental aspect of app-supported menstrual tracking. As mentioned in the section above and as evident from the following extract, most participants understood the biological-technological information displayed by period apps as objective truth, helping them to verify their subjective feelings and sensations:

“So, if I have the feeling that something [menstrual cycle-associated

sensations or feelings] happens, then I check whether it's true and yes. And often it is true, yes.” (Pt. 9, 32 years old)

The presumed objectivity of period apps seemed to be further strengthened by the automatization of cycle-logging through period apps:

“I just have to click it [start of period button] once and everything goes automatically, that’s it. For instance, if I forget to enter the end [of the period] ... it does so automatically. And then it’s in the system, automatically.” (Pt. 6, 34 years old)

Automatization and thus the reduction of tasks carried out by users appeared to play an important role in obscuring abstraction processes, potentially reinforcing users’ understanding of app-supported tracking as objective.

The supposed objectivity of digital technologies such as menstrual apps is not solely a result of the apps’ design and workflows. Rather, users also participate in the abstraction of their sensations and experiences during period tracking, often without realizing. As pointed out by Sherman (2016), self-tracking requires the imposition of boundaries on as well as the abstraction of the measured aspect in order to enable the comparison of data and guarantee their usefulness. These observations are also valid for people engaging in period tracking, as it is the users’

task to assess and abstract their experiences, sensations and feelings in order to make them comparable (with their own data over time as well as with the data of other users), and thus suitable for tracking. For recording of menstrual dates this seems to have been straightforward for most of the interviewees. However, when logging menstrual symptoms, not all of the participants reported on a linear process. For instance, some interviewees encountered difficulties when tracking factors such as emotions and cycle-associated corporeal sensations which usually have to be translated into the emoticons and pictograms provided by the apps:

“In ‘mood’ [tracking category], there were these stupid smileys, where it said ‘sad’, but ‘sad’ looked the same as ‘depressive’, and then I thought ‘that doesn’t help me at all’” (Pt. 4, 22 years old)

Similarly, another interviewee mentioned having trouble entering their vaginal discharge:

“Well, I’d really like to observe my mucus, but the categories are ... I don’t know’ – Interviewer [reading out available categories]: ‘egg-white, sticky, creamy, atypical – atypical, that’s great’ – Participant: “Exactly. I would have liked to fill something, but then nothing really fit.” (Pt. 1, 29 years old)

In response to not being able to find satisfactory tracking categories, the interviewees stopped logging the respective symptoms.

5.3.2 Linking users, apps and data

During app-supported period tracking, changes in the understanding and experience of menstrual cycles are not limited to the fleshly body but involve the establishment of ties to other agents involved such as mobile devices, apps, other users and digital data. The present section aims to identify how these novel interconnections are created.

Predictive and physical closeness

As already highlighted in the preceding section, observation and analysis of menstrual cycles via apps influences users' perceptions of their periods and bodies, which are consequently understood as trackable, visualisable, manageable projects requiring monitoring and constant improvement. Next to affecting people's perception and experience of menses, period tracking often promoted the establishment of connections between users' bodies and their devices and data. An example was given by the participant of the following statement:

“[The predictions are] very, very accurate. So sometimes it [start of

menstruation] is the same day [as predicted by the app], sometimes it is – well it differs of course. But sometimes it is exactly on the same day. Then of course there are days where I'd say that there are two or three days in between. And then of course it is either before or after [the predicted date], it depends. But it is definitely, um, quite accurate. So that I sometimes think my phone is somehow connected to my body.” (Pt. 6, 34 years old)

Here, it seems that it was the relatively accurate prediction of upcoming periods promoted a feeling of connectedness to their smartphone and app. Reversely, when the participants experienced considerable differences between predicted and actual menstrual dates, they tended to consider the interconnections of their bodies to their devices as less profound. An example is in the following extract, where the participant explains their menstrual apps' inability to predict more precisely with their missing incorporation:

“the application can't predict it [period] because, let's see, it is not in my body, so this is my task” (Pt. 19, 23 years old)

In contrast to some of the examples mentioned before, the interviewee of the above statement attributes the competency of knowing about future menstrual dates to their own fleshly body rather than their menstrual app.

Sensory ties

As highlighted before, comparing menstrual apps' visualizations with experiences was not limited to period and ovulation dates but also included sensory factors associated with menstrual cycles. One example was given by a participant who charted changes in basal temperature via their menstrual app:

“Well when the temperature drops [indication for start of menstruation] then I try to focus on my body, like that I am more likely to perceive that I'm not in such a good mood, like most of the time when I am due, or that I have back pain, or twinging pains – things that would go unnoticed otherwise. If I didn't know that I had to pay attention to them.” (Pt. 7, 28 years old).

As noted by the interviewee, the depiction of menstruation-associated factors such as temperature changes increased their attentiveness to their bodily sensations as well as emotions. Whereas in this specific example the app's representations seemed to have guided the participant's actions, many other interviewees reported on mutual interactions between menstrual apps' visualizations and corporeal or affective sensations:

“Either I look at the app and then I can say: ah, now it's time or I feel something in my belly, and I look [at the app], and I say: yes, this fits according to the dates, my period. Like that I have found out

that I am in a quite good mood when I am ovulating. And that I'm in a depressive mood before the period starts (...) I wouldn't have figured that out without the app.” (Pt. 2, 30 years old).

As illustrated here, several interviewees appeared to establish sensorial ties to their apps through comparing the apps' data visualizations with bodily and emotional sensations. Interestingly, the sensorial ties established during menstrual tracking were not limited to visual stimuli. In one of the diary entries of my autoethnography, I describe a situation of stress and pain. After a day of twinging pains in my stomach my period had begun and filling its start in my menstrual apps I noted:

“‘Mi calendario’ [“my calendar” in English, name of menstrual app]: 2 days late says the app (...) I press the dog [icon] to enter my period. When I enter symptoms, I have the impression that I feel more pain.” (Autoethnography, 08.06.2017).

As evident from my autoethnographic notes, it was the visual as well as the haptic interaction with the app which caused me to feel increased levels of pain. Experiences of sensing corporeal pain through touching the smartphone/ app and knowing about and/ or sensing selves and bodies via seeing data appear to be closely interrelated processes during app-supported menstrual tracking.

Emotional ties

Menstrual apps do not only provide users with the option to track their emotional states but engagement in period tracking per se provoked emotions. In the interviews, the participants mentioned a variety of feelings that they associated with menstrual tracking. For instance, when reflecting upon past experiences such as discrepancies between predicted and actual menstruation dates, a considerable emotional impact was often evident:

“I will never forget the day when it [period] was eighteen days late, according to what the app said, it wasn't the app's fault, but my body's, because of the exams and stress” (Pt. 19, 23 years old).

Just like my interviewees, I experienced increased levels of stress when confronted with differences between actual and predicted menstrual cycle dates:

“according to my apps (I actually think all of them!) my period is supposed to start today. It is almost 5pm and so far, no period. I have to say that I worry a little, not because of being pregnant, more because of not coming up to the apps' expectations (!). Without the app I probably wouldn't even think about it.”
(Autoethnography, 25.11.2016)

Other interviewees highlighted that menstrual tracking via apps had a calming effect on them, often related to a feeling of enhanced control:

“I can have a bit more order with the application. Yes, it calms me down, because I am more in control, I am not as anxious anymore now that I know that it [period] can come the next days, for that it’s useful.” (Pt. 21, 30 years old)

In several cases, menstrual apps seemed to serve as instruments compensating the little acknowledgement the interviewees appeared to receive:

“When I use it [period app] I feel – as it has a lot of symptoms that you can enter – well I feel a bit understood so to say.” (Pt. 24, 18 years old.)

In addition, the interviewees also seemed to understand their interaction with period apps as a kind of conversation as they frequently used expressions such as “it tells me” to refer to their interactions with their apps:

“It [the prediction of periods] is perfect, it [the app] tells me when the next period will start, my cycles are always the same ... always on the same day, so it tells me correctly.” (Pt. 26, 27 years old)

The emotions involved in app-supported period tracking often seemed to strengthen user-app connections. For instance, menstrual apps can take on the role of an intimate companion, as highlighted in the following statement:

“[the app] is a kind of replacement for friends, because you can, I can enter everything in the app, yes? I can basically use it as a support and express my feelings somehow, without having to include anybody else.” (Pt.2, 30 years old).

During my autoethnography I noticed as well that I had developed varying affective ties to the different apps I used:

“Period tracker: 6 days late! I again realize that I don't enter the exact same things and strengths in the different apps.”
(Autoethnography, 08.06.2017)

Besides linkages between users and their apps, menstrual tracking also led to the establishment of linkages between different users. One example was given by a participant who compared their menstrual cycle-related experiences to the available tracking categories, thereby deducing other users' sensations:

“I didn't know that there were people who had a certain appetite, for example, sleeping more or were more tired, or felt like something sweet or salty, I didn't know that, so I've learned that with it [menstrual app], that, like that you have more [sexual] desire, so I

am, I have always been ignorant concerning those things.” (Pt.23, 21 years old).

In addition, some menstrual apps promote the creation of connections between different app users and other people involved. For instance, they offer features that enable users to share their cycles with friends, other users or partners. Other apps offer forums to share experiences among users. Moreover, some automatically compare the symptoms entered to those of other trackers who menstruate around the same dates. During the autoethnography, I was using apps with all the functions mentioned. One app’s information about my “cycle twins” - i.e. trackers who menstruate around the same dates - made me feel connected to other users:

“Eve [name of menstrual app] tells me more about my 'cycle twins', in a way it makes me feel connected to other menstruators.”
(Autoethnography, 01.11.2016)

As evident here, apps actively engage in conversations with people and other devices as they comment on, exchange and forward the information entered by users during period tracking.

Co-evolving with menstrual apps

When people and technologies interact, they influence each other, learn from each other and thus co-evolve (Lupton, 2016a). This is also true for app-supported observation of periods: as demonstrated above, the use of menstrual apps had an impact on my participants' perceptions and experiences of their menstrual cycles and bodies. Vice versa, menstrual apps changed as well as their algorithms adapted to their users' recordings in order to provide more exact and personalized depictions. For instance, one of the interviewees noted how their app's predictions of fertile days had changed:

Interviewer: "Does the app display fertile days?" – Pt. 2: "Yes, in the beginning. But then, there was an irregularity in the cycle and since them it doesn't display the fertile days ... and I don't know what to do that it will predict them again." (Pt. 2, 30 years old)

During my autoethnography I also noted changes in the apps' design resulting from users' feedback to the developers as highlighted by the two extracts below:

"Clue seems to become more and more gender-inclusive ('Finding a trans-friendly OB/GYN', which they explain is a reaction to people's requests for help concerning gynaecologists)" (Autoethnography, 01.03.2017)

“Reproductive health hackathon: Clue gives insight on how they are using the data they collect and try to improve the algorithms in order to improve the predictions made by the app.”
(Autoethnography, 01.04.2017)

Through adaption of their algorithms, menstrual apps are more likely to precisely predict upcoming periods, fertile windows and symptoms. As demonstrated in the beginning of this chapter, accurate predictions are likely to increase the connectedness of users to their smartphone and app.

5.4 Data (mis)use, privacy and surveillance

The present chapter examines how users experience and react to surveillance and privacy issues in the context of app-supported menstrual tracking. In order to do so, I draw upon the user interviews as well as the autoethnography. The interviews comprised a section on privacy issues including questions about the privacy policies users have to agree to when downloading a period app, their opinion on privacy, surveillance, data sharing and related responsibilities during period tracking, and their reaction to a potential situation of data misuse. Inspired by Lupton's (2017) and Ellis et al.'s (2013) papers on affective atmospheres in the context of digital health technologies use and surveillance, the interviews also included a question on the participants' emotions regarding surveillance. As most of the participants did not exclusively refer to period tracking but often reported on their general experiences and practices concerning privacy, data misuse and surveillance, the chapter comprises findings of a broader context including the use of other health technologies and social media platforms. In specific, this chapter is divided into six subsections: 1) experiences of and reactions to menstrual apps' privacy policies, 2) the understanding of personal data as currency and 3) the participants'

takes on responsibilities, 4) data sharing, 5) their strategies to protect themselves and others from data misuse and practices of privacy management, and 6) other forms of surveillance mentioned during the interviews.

5.4.1 Privacy Policies

As with any other kind of app, when downloading apps for menstrual cycle tracking users are asked to read through and required to agree to a contract comprising usage rights and a privacy policy. In the interviews – and if not brought up earlier by the participants - I commonly introduced issues of privacy and surveillance by asking the interviewees about their reactions to period apps’ “Terms and Conditions” and “Privacy Policies” or “General Terms” as these contracts are termed. Only few of the interviewees reported on having read their apps’ general terms and among them most said to either have quickly skimmed through the text or to have given their permission after a brief attempt to go through it. Several participants highlighted that the contracts presented by the apps were long and laborious, as illustrated by the following extract:

“All those terms and conditions, I always find it incredibly laborious to go through them, most of the time it is that long that nobody is

reading through it in detail and that annoys me quite a bit [laughter].” (Pt. 8, 36 years old)

As exemplified here, most of my participants accepted contracts without (complete) reading. In the above extract, by stating that “nobody is reading through it in detail”, the interviewee notes how widespread and thus normalized this behaviour has become.

In my study, being overwhelmed by the amount of text presented by the apps even applied to experts as emphasized by the following extract from an interview with a legal practitioner:

“I think I always read a part but then it is that long that I stop reading [laughter]. I mean, because I have been trained [as a legal expert], um, I quickly skim through it. And if I come across something peculiar – I mean, in general you can forget about it anyway [laughter].” (Pt. 9, 32 years old)

Practices such as “quickly skim[ing] through it” come as no surprise as reading of the apps’ complete terms and conditions as well as privacy policies would require a considerable amount of time: a study carried out in 2008 – the year when Apple first introduced mobile apps – estimated that internet users would need 76 working days per year to read all the privacy policies they encounter online (Madrigal, 2012). By now, given the continuously increasing amount of time people spend

online and using apps, the time needed to go thoroughly through all the privacy policies one encounters is likely to have increased further.

At the start of my autoethnography, I also encountered difficulties regarding one of the app's terms and privacy policies. Even though I had the intention to read through the respective contracts in detail, I first unintentionally skipped them and then found it too laborious to go into further detail as evident from the extract below:

“Terms and Privacy Policy - I oversee that when entering the app, I sign in with my email and password – terms and privacy policy – I start reading it, too long – I just agree.” (Autoethnography, 01.10.2016)

When asked about menstrual apps' terms and privacy policies, some of the interviewees also pointed out the lack of options, placing them in a “take it or leave it” situation:

“I could write it down [refers to a menstrual paper calendar] but because I need it, so when I use it I quickly go over it [terms and conditions] and then [laughter] – that's probably not very smart, um. But [laughter] you can't install it if you don't accept it.” (Pt. 4, 22 years old)

Some interviewees noted an improvement regarding the permission the apps requested as their operating systems had replaced long policy texts by a list highlighting the most important aspects:

“Well now Android is making it a bit easier when it comes to the permissions of access you have to give, no? It presents you several pages such as ‘I allow this application to see my contacts’, or stuff like that, such as a list of three things. Then, [you decide whether] yes or no, so jeez, this takes ten seconds to read, so I do read it, and if I don’t want that, that it will see my contacts then I select ‘no’, and it doesn’t. But the typical enormous text block, the long one – no.” (Pt. 19, 23 years old)

As indicated by the above statement, apps are increasingly using a granular permission model which offers users to grant or deny access to particular functions when needed. Through this model, users can download and use apps without having to agree to all the requests made by the apps, as noted by the interviewee above. However, this novel mode of access authorization does not replace apps’ general terms which include property and usage rights. As evident here, the different kinds of legal documents users have to agree to can lead to confusion instead of simplification.

Moreover, it was also common that the interviewees could not recall approving or having read any contract when downloading their apps:

Interviewer: “And when you downloaded the [menstrual] app, did you notice any terms or policies you had to read?” Pt.: “Well, might be, but no, I don’t remember if I read them or no [laughter].” (Pt.

15, 32 years old)

Others assumed to have given a global approval to all apps available in app stores:

Interviewer: “And when you downloaded the [menstrual] app, do you remember approving terms and conditions?” Pt.: ‘Um, I don’t think so, I didn’t have to do anything, but I am not sure if Apple, if iTunes – if you have an iPhone account you already accepted the terms, I am not sure. I don’t remember accepting anything.” (Pt. 13, 18 years old)

There was one participant who temporarily interrupted the installation of their menstrual app because of privacy concerns:

“I saw that it [menstrual app] connected to the information from Google, or, that it was asking you for access to one of the [other] applications, no? So with privacy and those things, in the beginning I say ‘I should think about it – will I do [install] it or not?’ Actually I left the app, I mean, I didn’t accept, and two days later or so I said ‘well, that’s it, I accept’, I also have WhatsApp and if it’s open well [moans] they can do with your life whatever they want.” (Pt. 14, 32 years old)

Although sceptical at first, the interviewee of the above extract decided to keep going, arguing that they were already using other apps which potentially violate their privacy to an even greater extent as “they can

do with your life whatever they want”. The statement conveys a feeling of “no way back” once one has started using digital media. Here as well as in several of the following extracts, “they” is not further specified, although “they” seem to play an important role as they are assumed to have the capability to strongly impact on the participants’ lives. The lack of specification is most likely due to the fact that users do not know who exactly they are talking about.

5.4.2 Data as Currency

As emphasized by van Dijck (2014), people are not willing to pay for privacy. Rather, data have become a novel currency that can be exchanged for digital services. For my study, it seemed that the participants did not even contemplate the option of paying for more privacy. Among the interviewees, only two reported on having paid for the menstrual app they were using, all the others were using apps that were free of charge. The two interviewees who used a paid version of a period app stated other reasons for their choice than increased privacy protection. In fact, the menstrual apps used by my participants did not seem to provide such an option. The normalization of data sharing in exchange for digital services also arose from the wording used the interviews. Most participants used expressions such as “selling your

data” and “selling yourself” as evident from the subsequent extracts. For instance, talking about having improved their knowledge on consumers’ rights concerning data storage and privacy, the interviewee continues as follows:

“So I am much more aware [of privacy/ consumer rights], but it’s true that in the moment of downloading it [the menstrual app] I am not, you simply accept, you accept (...) in all of that we are not aware of how they are using them, the data. What, what I think? That it’s very bad, but in the end, I sell myself.” (Pt. 16, 32 years old)

In this extract, the interviewee mentions that “we are not aware of how they are using them”, pointing to their unawareness regarding the further use of the data they feed into menstrual apps. The participant juxtaposes “we” and “they”, presumably meaning users and app developers or data processing companies. Often, as indicated by the above extract, there was a contradiction between the participants’ presumption of potential data misuse and their reaction as most interviewees stated to just have continued using the app. The same conflict is also present in the following statement which represents another example of the “selling yourself” discourse:

“I have accepted the terms that they have suggested, no? Knowing that it is like selling yourself really. But even if I imagined that it had

an effect on me – what would I do, which concrete actions would I take? You can, as a user you can file a complaint, no? There is the consumer protection office and all of that, but in the end, I have never completed anything.” (Pt. 14, 32 years old)

The latter statement comprises an issue that arose frequently from the interviews: self-responsibility. This will be further discussed in the following section.

5.4.3 Responsibilities

As discussed before, the assumption of the responsibility for guaranteeing menstrual and overall health was an important aspect in the interviews. This was also true for the management of privacy issues as evident from the extract presented in the previous subchapter. If not mentioned by the participants spontaneously, the aspect of responsibility was introduced in the interviews by asking the participants whom they assign the responsibility to regarding the secure management of their data and privacy protection. As in the statement above, most interviewees stressed the responsibilities of app users to avoid being surveilled:

“Well, on days where I am thinking about it [being surveilled], um, I want to, I want to leave all my networks, I want to erase all my traces from the internet, I get very angry, but in the end I am not

doing anything, I am pissed off alone in my house and that's it, yes, yes, no, no, I don't do anything, so, um, I feel terrible, I feel very bad to be observed but I think that I am the one accepting the terms and conditions, right? So, like that it's me promoting that, and in order to avoid it I would have to be on a remote island and that's impossible, yes." (Pt. 26, 27 years old)

The expressions "in the end I am not doing anything", "I am the one accepting the terms and conditions" and "it's me promoting that" indicate that the participant is blaming themselves for not taking enough care regarding the security of their data. However, the interviewee also points out the difficulty of escaping digital data production and sharing by stating that they "would have to be on a remote island and that's impossible", echoing the idea of inevitability as presented in some of the statements before. Often, asking for responsibilities evoked strong feelings such as anger ("I get very angry, I am pissed off") and discontent ("I feel terrible, I feel very bad"). The interviewee of the above extract notes the individualization of their situation by mentioning that they are "pissed off alone". This stands in contrast to other discourses presented here where participants seemed to juxtapose a "we, the users" against "them, the developers".

Whereas the responsibility of app users was also pointed out by the participant of the following statement, they also highlighted the app developers' role more clearly:

Interviewer: “Who do you think is responsible for the security of your data?” Pt.: “The people who work for the application, no?” - Interviewer: “Yes, somebody else as well?” - Pt.: “First, let’s see, first it’s you [user], you need to protect your data, you are the first to have to try not to enter certain data etc. and then second well the site, for example, in this case the application or the website.” (Pt. 23, 21 years old)

The extract illustrates the view of several of the participants who understood users as the primarily responsible agents for data security, ranking developers second.

While most participants were holding users and app developers accountable, one interviewee stressed the responsibility of the government:

“Um, basically I think that, um, because it [data protection] is a basic right in Austria, yes, I actually think it’s important, I mean there is a reason for it being a basic right. On the other hand, it is, let’s say it’s being handled with little care by the authorities ... health data are particularly sensitive ... meaning that they can be misused and [users] can encounter disadvantages, so I think they should be especially protected. That means that it’s not very intelligent to be

using health apps [laughter]. Probably not, I haven't been thinking about it that much, I mean being a healthy person you probably don't think much about it, I believe that you only start thinking about it once you have a disease, if you want to take out a private health insurance or if you are working for an employer where this would be a problem – a friend of mine suffers from a serious illness and she doesn't want that her employer to know.” (Pt.9, 32 years old)

Here, the participant emphasizes the importance of data protection, especially concerning the privacy of health data. Against the background of the adoption of novel laws regarding user privacy, they criticize the negligent handling of digital (health) data by the Austrian authorities. Reflecting upon the legal situation of data protection, the interviewee then concludes that “it's not very intelligent to be using health apps”. It becomes evident that as a legal expert, the interviewee is better informed than the average users. Nevertheless, they mention not to have given much thought to issues of data security, explaining it by their individual situation as a healthy person and contrasting it to other's experiences such as those of one of their friends.

Further, the same interviewee points out the role of the state as an agent of surveillance and highlights the potential transfer of sensitive health

data to the private sector including insurance and pharmaceutical companies:

Interviewer: “So do you think that data protection is weak in Austria?

That the authorities have access to your data?” - Pt.: “Well yes, I mean they are about to pass a law which allows them planting trojans on your smartphone, so the data for sure aren’t protected. And even if it’s only the state, but I mean the state also has an interest in your health data.” - Interviewer: “And corporations?” - Pt.: “Yes, in any case. You only have to think about insurances or whatever. Or pharmaceutical companies, for targeted advertising.”

(Pt.9, 32 years old)

The participant of the above extracts was the only one to call for government action regarding data privacy. The contribution of the interviewee is also interesting for its mention of the potential negative influence the circulation of health data could have for people in different life situations.

5.4.4 Data Sharing

In discourses on data sharing and surveillance, privacy and security are often presented as mutually exclusive as privacy is commonly seen as the price one has to pay for security. The following extracts represent examples of this discourse:

“Well, that is, well, sometimes I think it would be smart to record more data when it makes life safer, on the other hand it won’t get safer anyway, but I think I don’t have anything to hide.” (Pt. 5, 37 years old)

Here, the interviewee clearly contrasts privacy with security issues as “record[ing] more data” might “make[s] life safer”. Later however, they relativize their statement by expressing doubt that life will get safer that way. They note that they “don’t have anything to hide”, which points to an understanding of privacy as associated with the concealment of negative aspects. As the interview proceeds, the participant continues as follows:

“Um, as long as they [collected menstrual data] are detached from my personal data, I am in favour [of sharing] because I think, from, from these data one can generate insights and learn something.” - Interviewer: “You mean that for medical research you would be in favour of sharing your data?” Pt.: “Yes, I’d say.” (Pt. 5, 37 years old)

As evident here, the participant of the above extract understands their data as an important resource in the generation of new knowledge and the advancement of biomedical research.

The following statement represents another example of the participants’ willingness to share data for scientific purposes:

“Well, in any case I am willing to share [my data] for scientific purposes, as long as they are anonymous. But even if, there are so many people, they don't know who I am. And if they'd sell it [to another company], I don't know. From today's view I'd say I don't care. If it should actually happen then I'll see. Then we'll meet again [laughter].” (Pt. 1, 29 years old)

As exemplified here, many of my participants understood anonymity as one of the most important aspects regarding data security. Anonymity was commonly defined by the interviewees as concealment of their name. A few participants also mentioned the importance of concealment of other personal data such as the date of birth as exemplified by the statement below:

“Well the name would definitely have to be omitted, the date of birth as well I guess and the e-mail address [laughter] – so all these explicit things” (Pt. 5, 37 years old)

While provision of (menstrual) data for biomedical research was generally perceived as a positive act, many of the interviewees highlighted disagreement with data sharing for marketing reasons:

“Um, well if they [menstrual data] are being used for marketing, then I don't think it's great, um, for medical research I think it's good and even, yes, it should be supported.” (Pt. 8, 36 years old).

One participant who used to work in marketing further noted:

“I work in or I used to work in marketing, no? It changes your awareness a bit regarding this topic [data sharing], um, if you read about it and get to know some things, then it is alarming what is actually possible.” (Pt.5, 37 years old)

As an expert, the interviewee of the above extract had gained a deeper insight into the mechanisms and possibilities of marketing which they define as “alarming” concerning the sharing of data.

Nevertheless, several participants highlighted the unavoidability of data sharing as they understood processes of data sharing and processing as fundamental components of today’s economy, as exemplified by the below extract:

“Man, I would prefer that they didn’t use my data to be honest, but I think that’s one of the pillars of the economy today.” (Pt. 17, 31 years old)

Marketing, or more precisely, advertising on smartphones and computers played an important role in my participants’ discourses on surveillance. Often, the sudden appearance of adds for products or services coinciding with the interviewees conversations and google searches was understood as a confirmation for surveillance and transfer of data from one webpage or app to another. The two statements below represent examples of this perception:

“I was with my boyfriend in the house and he showed me the page, the page he was looking at, there were these cheap Viking horns, and I was searching for them on my mobile (...) and the next day I was on my computer and the advertising of the [Viking horns’] homepage appears.” (Pt. 19, 23 years old)

“Everything is being passed on. If at Google, GMX, or Yahoo or Facebook or Twitter doesn’t matter. At Amazon, if you are looking for something at Amazon, then you get the advertising on GMX, even though they shouldn’t be connected. But they are.” (Pt. 11, 28 years old)

Moreover, another participant mentioned wiretapping when telling me about the experiences of a working colleague:

“Well, our, our secretary, she is convinced - she is using an iPhone - and she is convinced that she is being wiretapped. Because, one talks about all kinds of stuff and then, the next day, the [respective] add appears on her phone. This is frightening somehow [laughter].” (Pt. 9, 32 years old)

The interviewee of the above extract was not the only one to be concerned about wiretapping. More often however, the participants reported on feeling monitored during internet searches as highlighted above as well as by the subsequent extract:

“Man, it frightens me a bit [laughter], because I don’t know which

companies know exactly what [websites] I am visiting all the time, you know? And I don't know, anyone who takes my computer and surfs [the internet] a bit will see the ads and will know what I have been doing.” (Pt. 19, 23 years old)

In the two statements above, the interviewees point out to be frightened by the fact of being surveilled. As in the extracts mentioned above, they encounter discomfort with laughter, most likely to release tension. Interestingly, in the latter extract, the participant does not exclusively refer to companies as agents of surveillance but mentions the risk of disclosing sensitive information to friends or acquaintances, which seems to be no less worrying for them. Disclosure of information to the immediate environment is discussed in more detail further below.

5.4.5 More Privacy: Users' Strategies

In order to deal with potential privacy violations and surveillance, my participants seemed to employ varying strategies. As evident from several of the extracts presented so far, many participants either relativized the risks associated with sharing of personal data or surrendered. For instance, several interviewees appeared to calm themselves down by questioning the importance of their data:

Interviewer: “Would you say that the security of your data is

important?”– Pt.: “Yes, ultimately yes, but um, my data aren’t, the only data [I have provided] are email and password, and my menstrual data. Who will want them? A Hacker? I don’t think so [laughter].” (Pt. 23, 21 years old).

Whereas most of my participants identified either governments or corporations as potential agents of surveillance, this interviewee mentioned potential data violations through hackers. However, they dismiss this risk immediately by highlighting the insignificance of their data. The discourse of not being important or interesting enough to be subject to data misuse or surveillance was common among the interviewees as also evident from the below extract:

“I mean, I’d say, data protection is a difficult topic because, I mean, in general I don’t mind somebody having my menstrual data, because ... I think they are probably not as interesting for other people as they are for me, but from the point of view of data protection it isn’t that cool of course. But in general, I wouldn’t have any problem personally.” (Pt. 3, 25 years old)

Although the interviewee notes the problematic nature of the disclosure of their data, they come to the conclusion that they “wouldn’t have any problem personally”, arguing that their data “are probably not as interesting for other people”.

One participant who used the menstrual app in order to learn more about their health situation argued not to have any other convenient option:

“Actually, I have to use it. It is simply convenient for me. I could write it [menstrual cycle dates and symptoms] down, but it’s a kind of necessity for me.” (Pt.4, 22 years old)

Other participants seemed to have surrendered to a certain extent, highlighting their subjection:

“What should I do? It is, um, they anyway save every fucking file. As soon as you enter something in the internet it is detectable. Everybody, um, if someone is interested in my medical record then he just needs to enter the internet and hack a bit and he will be able to access it. So you don’t have any chance to hide something nowadays (...) you are defenceless, it’s not within your power anymore, you can only try to maintain your privacy as far as possible by not posting every holiday photo, event or place. And everyone should consider that by himself, so everyone on his own.” (Pt. 11, 28 years old)

Against the background of an internet-saturated world, the interviewee states how “every fucking file” is being saved and any activity online is “detectable”. While they refer to internet or app corporations in the first part, the participant then switches to the potential hacking of their

data thus raising security concerns regarding the storage of data. Further, they note users' lack of control of their data and come to the conclusion that the only thing that can be done is to avoid sharing too many personal details in the first place, a strategy carried out individually – “everyone on his own”.

In fact, limitation of disclosure of personal information was among the most frequently mentioned strategies to maintain a certain level of privacy. Also during my autoethnography, feeling surveilled led me to restrict the information I was logging in my menstrual apps, especially if the symptoms were negative:

“I am feeling kind of lousy today, tired, sad, angry at the same time – I wonder if I have PMS and check on my phone: 5 days left for the next period. I am not sure if it hasn't been just a tough week at personal and work levels. I don't enter that in the app, I feel too surveilled for that.” (Autoethnography, 01.03.2017)

On a more general level, one of the interviewees reported on having removed their birth year from social media sites because they feared forgery of their identity documents:

“I have, I think I have removed by birth year from all my social media accounts [breathes in], not because I am vain, because I am approaching 40, but because if somebody has your name and date of birth then one can falsify your ID documents and so on, I'd find

that spooky, um, yes.” (Pt. 5, 37 years old)

Elsewhere in the interview, the participant mentions to especially want to protect their child’s privacy by not uploading photos of them on the web:

“Um, the only thing that I really care about is not uploading pictures of my child into the internet, this is the only thing that I am doing really consciously.” (Pt. 5, 37 years old)

Another strategy to maintain a certain level of privacy mentioned by the participants was disabling the GPS (Global Position System for determination of geolocation) tracking services on their smartphones:

“I don’t want that in the background – I am pretty sceptical with smartphones – they want GPS or data, request of location, and I simply don’t like that, first of all because of the battery and second because I don’t want that my phone will be tracked all the time, what probably happens anyway, but like that I have tried at least [smirks].” (Pt. 4, 22 years old)

Disabling the GPS was also pointed out by another interviewee along with other strategies:

“I pay attention to the permission that I give to my apps, I pay attention about the geolocalization, and um, yeah, tricks that might be hidden in some settings or some apps and I try to keep it as secure as possible.” (Pt. 22, 35 years old)

By using expressions such as “I have tried at least” and “I try to keep it as secure as possible”, the interviewees of the above extracts acknowledge the limitations users face when trying to protect themselves from privacy violations. Both participants demonstrated a high level of digital literacy. Their experience concerning issues of data security and privacy is not only reflected by their concerns, but also by their wording such as “geolocalization” and their strategies, such as looking for “tricks that might be hidden in some settings or some apps”. One more reaction to privacy violations was taping cameras on notebooks and televisions, as highlighted in the subsequent extract:

“I have, um, I have taped the camera of my notebook and TV. I really did. Because it bothers me somehow. Not the microphone but the TV yes, only recently I have come to know that the TV has a camera [laughter]. I find that very worrying.” (Pt. 9, 32 years old)

A very similar statement was given by one of the interviewees from the statements above who reported on having high digital literacy:

“What I also do for instance, I tape the camera. Because that, I don’t like that. I find that strange. It is actually – [the camera] can see pretty far and the notebook is open all the time. I tape it.” (Pt. 4, 22 years old)

Moreover, the same participant mentions another strategy, namely the avoidance of an internet connection on their computer:

“Um, I used to have no internet on my PC. I used to say, this one stays internet-free, this is my working computer, but at some point, that doesn’t work anymore, no? It is, I really didn’t have any internet [on this computer] for three years. Everything was excellent and now there is internet and it is slow and stuff.” (Pt. 4, 22 years old)

Here, the interviewee associates the slowing down of their computer to connecting it to the internet, most likely suggesting the presence of spyware (software enabling unauthorized persons to secretly monitor computer use). Keeping it “internet-free” represented a useful way to protect themselves against privacy violations. However, as the participant points out, “at some point that doesn’t work anymore” as many programs are internet-based.

Although acknowledging the problematic nature of data sharing, there was one interviewee who highlighted the empowering potential of digital media use:

“Uploading information that could put me in a situation of vulnerability – never. I don’t use, for instance, I don’t upload family pictures on social media. Above all, I use social media more and more as a space for work and feminist activism, no?” (Pt. 18, 40 years old)

5.4.6 Immediate Surveillance

The extracts presented so far refer almost exclusively to a kind of surveillance where actions of monitoring and data-processing take place at a distance and are often carried out by inaccessible subjects, corporations, institutions or computers. However, in the interviews various participants highlighted other forms of surveillance involving their immediate, everyday life environment. A very common concern stated by the interviewees was being monitored by others who look at or gain access to their smartphones and thus menstrual apps. In this context, several interviewees talked about the design of their menstrual apps' icons. For instance, one participant noted the importance of an abstract icon for people who did not want others to know that they were using a period app:

“Because I thought it was very cool that it [menstrual app] has a neutral design and that you can't see immediately what it is on the phone, in case it is uncomfortable for someone.” (Pt. 3, 25 years old)

By “in case it is uncomfortable for someone”, the interviewee of the above extract refers specifically to people of trans-identities whose

assigned sex might be revealed by their use of menstrual apps (see the following chapter for their reference regarding trans people).

Although not in the context of gender/ sex disclosure a similar remark regarding the concealment of period apps was made by another participant:

“No, it’s nice to have little flowers there [on the apps’ icon] [laughter].

Like that it’s rather hidden, no? That means if someone goes through your phone, one doesn’t notice that it is, um, a menstrual app.” (Pt.6, 34 years old)

For the interviewee of the above statement, the “little flowers” represented a design element which helped hiding the actual purpose of the app. Whereas they seemed to enjoy the design, others mentioned to have been hiding the app on the second screen because they felt embarrassed by the “sweet feminine” design:

“Well I used to have it [menstrual app] on the second page for a long time because in the beginning I thought ‘oh my God, I have a period tracker app’ [laughter], um, a little flower [refers to icon], I wouldn’t have really needed that, but it doesn’t bother me anymore (...) I don’t need something sweet feminine.” (Pt.5, 37 years old)

Embarrassment was also highlighted by another participant who said to access their period app’s content via a password:

“The app gives you the option to set a password that only you can open it, and I have one because others knowing those things makes me feel embarrassed.” (Pt. 24, 18 years old)

Not all of the interviewees were ashamed or wanted to hide their apps’ content. On the contrary, some expressed indifference and said to be logging their menstrual data independently of the location:

“I am checking it [menstrual app] when I am due or not (...) I don’t care if someone sees what I am doing.” (Pt. 20, 23 years old)

When referring to more immediate situations of surveillance, some participants pointed out experiences that went beyond period tracking. For instance, one interviewee highlighted how they felt observed by their mother checking their online activity via a messaging service app:

“In WhatsApp, as it shows your last, I have set it to show the last connection, so my Mum comes the next day ‘What were you doing at half past twelve when going to bed?’ [laughter]. This is the only control I have [laughter].” (Pt. 23, 21 years old)

While the participant of the above extract did not seem to be bothered by their mother’s control (“I have set it to show the last connection”), other interviewees reported on more troubling situations:

“I felt more surveilled, for example, when I had my last boyfriend, because he took my phone for instance, and went through my

applications to see things, but lately, no.” - Interviewer: “What did he aim to see, your last boyfriend?” – Pt.: “Well, if I was taking to someone and things like that.” – Interviewer: “Did it bother you?” – Pt.: “Well, yes to be honest, because he didn’t trust me, he didn’t trust me as I used to trust him.”– Interviewer: “So you didn’t take his phone?” – Pt.: “No.” (Pt. 24, 18 years old)

As evident from the extract, digital technologies such as smartphones and apps can lead to novel forms of gender-based violence. In the example given by the interviewee, their former partner was taking their smartphone in order to control their interaction with others, demonstrating a behaviour of domestic violence.

Another form of surveillance that arose from the interviews concerned the interview situation in itself. Although the participants signed a consent form that guaranteed the anonymization of their data, some stressed the necessity of confidentiality during the interview process. For instance, one participant reminded me not to share the information on the web:

“there are very few things, that – that doesn’t end up on the internet, the things we are talking about, yes? – that would be problematic for me.” (Pt.5, 37 years old)

Another example was given by an interviewee when sharing information on an issue that they considered to be particularly sensitive:

“I think that they – well what I am saying really has to be kept private – but I cannot imagine that they didn’t ...” (Pt. 7, 28 years old)

In both extracts the participants acknowledge that the interview situation in itself represents a form of data sharing and surveillance. In this specific case the participants were sharing information that they feared was going to put them in a situation of increased vulnerability. As evident here, the interviewees of the above statements did not seem to regard the signing of consent forms as granting sufficient protection against privacy violations.

5.5 Perceptions of and responses to gendered menstrual app design

The present chapter focuses on the interview participants' perceptions of and responses to gendered menstrual app design and is organized into two sections: the first part reports on the interviewees' identification and interpretation of gendered menstrual app design. The second part examines how gendered menstrual app design influenced the interviewees' practices of period tracking and highlights ways through which hegemonic associations of menstruation with female gender, heterosexuality and reproduction were being challenged. This chapter represents a more elaborated version of a short paper I have published in 2018 (Levy, 2018).

5.5.1 Users' perceptions of gendered menstrual app design

During the interviews, the participants were encouraged to reflect upon their apps' graphics and functions. Moreover, inspired by Gloria Steinem's essay "If Men Could Menstruate" (2019) and with the aim of drawing specific attention to the gendered character of menstrual apps, the interviewees were asked to envision a period app designed for cis men. The following section examines how the interviewees

deciphered and interpreted aspects of gender in menstrual apps' graphic design as well as in their functions and workflows.

Perceptions of gendered graphic design

When asked to describe the design and functions of their menstrual apps, many of the interviewees pointed out that their menstrual apps were employing graphical elements and colours that they understood as gendered. The most common characteristics associated with femaleness and womanhood were bright colours, elements such as flowers or baby animals, and a more detailed graphic design in general:

“Well, it was a girlish, tacky design ... pink and with flowers. So, it was [designed] for girls, or women actually – yes women, a little strange, isn't it? Well, I have the feeling that they all look the same.” (Pt. 11, 28 years old)

Reactions to gendered graphic design which was frequently described as “girlish”, “tacky”, or even “childish” varied significantly, ranging from enjoyment to indifference and dissatisfaction. The statement above expresses the participant's discontent regarding the app's feminized graphic design. A similar opinion was voiced by an interviewee who had switched from one period app to another due to a change of smartphones. Reflecting upon the graphic design, the

interviewee noted a clear difference concerning the graphics of the current and previous period app:

“She [current menstrual app] has such a cool design [laughter], because, well, the old one used to have this pink background, or purple with little flowers ... I simply don't like this 'it's your period and therefore it has to be pink and you are a girl” (PT. 4, 22 years old)

Whereas the participant of the above statement pointed out to prefer a more neutral design, some participants did enjoy the feminized graphics. For instance, one interviewee stated that the app's “colourful” design was an important factor when choosing an app for menstrual tracking:

“I am not the type, don't know, [who likes] black and white, I simply prefer the colourful [design]. I simply like it better.” – Interviewer: “And the design was a decisive factor when choosing the app?” – Pt.: “Yes.” (Pt.6, 34 years old)

Moreover, some of the participants went beyond reflecting upon their individual identities and highlighted the impact feminized menstrual app design might have on others. For instance, one interviewee decided to use a more neutrally designed menstrual app in order to support developers offering apps for trans-people or menstruators who do not identify as female:

“I have used other menstrual apps before, and they all were very pink.

I don't have a problem with that because I like kitsch very much, but I found the interface of Clue [name of menstrual app] more appealing, um, also concerning other people, who might not be able to identify with pink and kitsch, especially when I think of trans people.” (Pt. 3, 25 years old)

As highlighted by the former statement, the colours and graphical elements of some of the menstrual apps were perceived as gender neutral. This usually concerned apps with minimalist interfaces in colours such as red or blue, as pointed out in the following statement:

“A typically feminine design would look different. This one is red and blue, red is obvious [referring to the color of menstruation], yes. Blue is actually a color associated with masculinity, no? Well, I think it's shapes are very clear as well.” (Pt. 9, 32 years old).

In order to go into further detail concerning the gendering of menstrual apps, I asked the participants to envision the graphic design for a menstrual app developed for cis men. Often, their responses depended on the kind of app they were using. Interviewees who were using an app that was commonly perceived as more gender-neutral, usually did not express any need for a change in design:

“In the hypothetical case that men had the period, no, I don't think that there would be any difference, you wouldn't have to change

anything.” (Pt. 13, 18 years old)

Those using apps understood as feminized often assumed that men's period apps would be more gender-neutral:

“Um, certainly less flowers ... I assume that it wouldn't be in pastel colors. And that they would be simply more gender neutral, I think ... for sure not these typically female colors.” (Pt. 10, 18 years old)

In addition, several of the participants imagined that men's menstrual apps would employ masculine graphics such as dark colours, themes from movies like Star Wars or Star Trek, or contain elements commonly associated with masculinity such as cars and motorbikes:

“Our [design] is all pink, pretty, a kitten, a small rabbit, you know? Theirs would be cars, motorbikes, blood and tits [laughter].” (Pt. 19, 23 years old)

Perceptions of gendered features and workflows

Identification of gendered aspects in menstrual apps' tracking categories and workflows was not as straightforward as deciphering feminized characteristics in the apps' graphic design. At first, only few interviewees mentioned biases. One example was given by a participant who highlighted heteronormative characteristics embedded in their app's design:

“In the beginning [of use] there is the question if I want to become

pregnant or not. Whereas, of course also non-heterosexuals [might want to become pregnant], but somehow it seems to me - well I find it funny this question 'did you have sex or not?', because it makes me think 'how is this connected to my period? ... because I couldn't find any correlation [between menstruation and sexual intercourse], well, maybe it improves your mood for a short while [laughter].' (PT. 4, 22 years old)

As evident here, through their workflows and features, many menstrual apps tended to reinforce associations of sexual intercourse with reproduction, thus potentially excluding non-heterosexual users as well as people who do not engage in period tracking for reproductive reasons. Interestingly, the interviewee of the above extract finds another, more inclusive explanation for their app's question regarding their sex life.

When I asked the participants to imagine the changes in menstrual apps' functions if they were to be designed for cis men, most came up with a whole plethora of ideas. Often, men's period apps were envisioned as more scientifically based, as pointed out below:

“Um, there would definitely be more medical facts, I think. Because there are more men in medicine, in the higher positions. And they can decide more than women because they know more [laughter].”
(Pt.4, 22 years old)

Here, the interviewee contextualizes menstrual apps within the biomedical field, cynically referring to structural inequalities. Others imagined cis-men's period apps to be more elaborated and less focused on emotions:

“I think it [menstrual app for men] would be much more complete, that is, logically thinking, it would be much more complete, let me think, I can't imagine a dude entering something like 'today I feel irritable!'.” (Pt. 26, 27 years old)

Here, the interviewee of the above extract refers to tracking of emotions, a feature that is offered by most menstrual apps. Just as the participant of the latter statement, many participants assumed that there would be changes in the tracking categories men's menstrual apps offer. While being attentive to one's emotional state via apps was often perceived as a female task, male trackers were commonly imagined to be more competitive and focused upon sexual activity:

“Men would enter in which cycle phase they pick up women and have sex [laughter]. What else would they enter? Um, sports, when they do sports, in which phase they are performing best and so on.” (Pt. 5, 37 years old)

However, other interviewees imagined cis-men's menstrual apps to be simpler concerning the features they offer:

“Probably it wouldn't have all the symptoms, pimples, changes in the breasts, well a lot of things, it probably wouldn't be as complex.”
(Pt. 21, 30 years old)

The assumption that cis men would require a more simplistic design was predominantly related to the perception that they would not be willing to invest the same amount of time in tracking their periods. A few participants even doubted that they would invest any time at all:

“I think they wouldn't use it. For example, I don't see my brother, no, he would get tired within two days of using it, you know. He wouldn't even have a look at it.” (Pt. 20, 23 years old)

5.5.2 Challenging gender via menstrual tracking

The intertwining of technology with society does not exclusively lead to the maintenance of gendered social relations but can also open up possibilities for their questioning and reinterpretation. As for menstrual apps, the gender scripts in their graphics, functions, and workflows did not keep the participants from engaging in practices of unintended use and re-signification, thus challenging the inscribed norms and values. Rather, several of the interviewees developed strategies to cope with and overcome resulting uncertainties and controversies, as described below.

Responses to gendered graphic design

During the interviews, several of the participants reported on practices of app-supported period tracking that went beyond intended uses and pretended ascriptions, thus challenging hegemonic associations of menstruation with cis-womanhood and/or heterosexuality. As mentioned above, many of the interviewees who were using menstrual apps employing colours or elements commonly associated with femaleness did perceive their menstrual apps' graphic design as gendered. However, this position was not shared by all the participants, as a few tried to overcome widespread connotations of certain graphical elements or colours as exclusively feminine:

“I don't care about the color, I mean, I don't care if it's pink because femininity goes beyond color, I mean, all colors belong to everybody.” (Pt. 25, 29 years old)

The users who were less content with the feminized graphic design of their apps developed different strategies to deal with their dissatisfaction. One interviewee reported on having felt embarrassed for having the flowery icon of their menstrual app on their phone in the beginning of use. As a consequence, they moved it onto the second page of the phone's home screen:

“Well I used to have it on the second page for a long time, because in the beginning I thought 'oh god, now I have one of these period tracking apps' [laughter], um, such a little flower, that's not what I needed, but now I don't mind anymore.” (Pt. 5, 37 years old)

While the interviewee of the above statement had managed to overcome their embarrassment, other participants who were dissatisfied with their menstrual app's design decided to change to a more gender-neutral version. For some, the gendering of menstrual apps' graphic design influenced their choice of app from the beginning:

“I was looking at two [different menstrual apps], and in the end I selected this one because the other one seemed to be super tacky with its pink flower.” (Pt. 17, 31 years old)

Responses to gendered features and workflows

Concerning menstrual apps' functions and their interpretation, there seemed to be more flexibility regarding alternative uses and interpretations. For example, some period apps provide the option to create own tracking categories, thus offering users to add and observe additional cycle-related symptoms. Whereas a few had created own categories, no one reported on having been using them over a longer period as they were usually perceived as more time-consuming and less appealing:

“You can create your own tags, but they are a little bit hard to maintain, and they are simply not as clear.” (Pt. 8, 36 years old)

Most period apps offer users to correlate different menstrual-cycle associated factors via an analysis function. Consequently, a plethora of symptoms, behaviours and experiences can be observed and interpreted with regard to menstruation and ovulation dates. Although many of the participants welcomed the option to track and analyse a variety of categories, most considered correlating factors via the apps' analysis function as too laborious, or pointed out not to be “so advanced”, i.e. not to possess the technical expertise regarded as necessary in order to use this feature:

“There you have the [menstrual] calendar, where I can see immediately the fertile phase and the menstrual phase. (...) and when it [menstruation] is irregular, then you get a kind of zigzag pattern [referring to analysis function of menstrual apps]. You can also have a look at one of the factors [menstrual symptoms].” – Interviewer: “Or relate several factors.” – Pt.: “Yes! But I am not so advanced [laughter].” (Pt. 1, 29 years old)

Nevertheless, several of the interviewees used their menstrual apps to keep record of mental and physical states and related them to menstrual cycle dates and regularities without making use of their app's analysis

function. For most, it was sufficient to correlate feelings and sensations with menstrual cycle phases right when they were happening:

“So, if I have the feeling that something [menstrual cycle-associated symptom] happens somehow, then I check whether it's true and yes. And often it is true, yes.” (Pt.9, 32 years old).

There were a few interviewees who explored the relations between certain symptoms and menstrual cycle dates via their app's analysis feature and over the long term. For instance, one of the participants aimed to find out more about possible connections between their mental health status and menstrual cycle-associated hormonal changes:

“In my case it's more about the hormones and the moods. And actually, it's more about ovulation, less about the period, because I already know that I am in a shitty mood when I'm on my period.” (Pt.4, 22 years old)

Regarding the above statement, critics might argue that menstrual apps potentially strengthen the association of womanhood and menstruation with emotionality, reinforcing the image of the uncontrollable, moody menstruating woman³. However, most of the participants seemed to appreciate the possibility offered by their apps to engage with their

³ For an overview on historical and cultural interpretations of menstruation, see e.g. Newton, V. L. (2016). *Everyday Discourses of Menstruation. Cultural and Social Perspectives* (Vol. 1): Palgrave Macmillan UK.

emotions and relate them to physiological processes. Moreover, it becomes evident that tracking of ovulation does not have to be connected to observation of fertility or contraceptive practices but can serve other means such as exploration of mental health issues, thus expanding associations with menstrual cycles beyond reproduction. It is also worth pointing out here that the observation of reproductive health via menstrual apps was not limited to heterosexual users, underscoring the importance of the distinction between different forms of reproduction and varying needs of contraception.

Until today, technology continues to be associated with masculinity, thus fostering hegemonic forms of masculinity and excluding women (Wajcman, 2009). However, in my study it was the correlation between technology and masculinity which opened up the possibility for a non-binary participant to engage in menstrual tracking:

“In my mind keeping track of period was, um, a very heterosexual practice. So, it's something related to reproduction and pregnancy. (...) Um, then, um, since I learned about this [app-supported tracking] I think [it is a] very convenient and efficient and quick method of, um, keeping track of your period, um, and also given that these tracking is mediated by technology, and I think that the cultural association in my mind was that, that technological mediation made it .. um, I mean this might sound a little sexist, but

[laughter], it made it less girly, um. Then I felt like I could do it too, you know.” (Pt. 22, 35 years old)

Despite the fact that most menstrual apps used by the interviewees of the present study seemed to have been developed for cis women’s bodies, the example here demonstrates that sex/ gender binaries can be challenged via menstrual technologies.

Besides alternative interpretations and unintended uses of technology, some participants also reported on rejection. In specific, three interviewees said that they had stopped tracking their cycles via menstrual apps. Their reasons differed: while one interviewee had to stop using their app due to amenorrhea (absence of period), two of the ex-users raised privacy concerns and highlighted the significant workload they required when using menstrual apps:

“Because one needs at least 15 minutes a day to enter everything [into the menstrual app], because one has to read a lot. And then to estimate the severity of one's symptoms, this requires quite a lot of time (...) This for sure played a role in stopping it.” (Pt.11, 28 years old)

6 DISCUSSION

Despite the increasing popularity of menstrual apps only limited scholarly attention has been paid to users' practices and experiences of period tracking. The present study's aim was to contribute to filling this gap by adding to the important but rather scarce research carried out so far. Based upon an interview study with menstrual app users in Austria and Spain, as well as an autoethnography using several period apps myself, I have presented five themes that seemed to be of particular significance when people engage in period tracking: 1) contexts, reasons and most common practices of app-supported menstrual tracking, 2) shifts in medicalisation of menses and bodies through period tracking via apps, 3) transformation of bodies and selves, 4) users' experiences of and responses to surveillance and privacy issues, and 5) users' interpretations of and responses to gendered menstrual app design. In the following, I will contrast the findings with existing literature on period and self-tracking apps, and relate the results to empirical and theoretical contributions from a variety of areas including Digital Media and Critical Data Studies, (feminist) Science and Technology Studies, literature on medicalisation, and studies drawing upon affective turn publications as well as embodiment literature.

6.1 Contexts, reasons and practices of app-supported menstrual tracking

6.1.1 Menstrual app selection

As highlighted in the results, the most common approach to find a fitting period app was searching app stores by entering menstrual cycle-related keywords. Further, a number of participants stated that they had come across period apps via adverts when randomly surfing app stores. For the interviewees who selected a menstrual app by themselves, the main reasons for choosing one period app over another were the app's graphic design and features, as well as good rating on app stores. The participants who had searched for a specific menstrual app often pointed out to have followed a friend's recommendation. Two interviewees downloaded an app suggested by vloggers (video bloggers). Once the participants had decided on a specific menstrual app, they usually kept using it for several years in order to guarantee the consistency of the collected data. As evident here, friends' recommendations played an important role in the selection process of menstrual apps. Also adverts, either in app stores or via video bloggers, seemed to have a relevant impact. The long-term engagement in period tracking stands in contrast to other research on health apps reporting on

high drop-out rates and short-term use (Peng et al., 2016; Rooksby, Rost, Morrison, & Chalmers, 2014). In an empirical study on women's use of fertility tracking apps, Gambier-Ross et al. (2018) note that there is no available research on the selection process of apps. The same appears to be valid for menstrual apps as I could not identify any studies on how people choose apps for period tracking. Hence, the data provided here give a limited but first insight into users' selection processes.

6.1.2 Contexts of menstrual app use

Inspired by Lupton's (2016b) suggestion to pay attention to the spaces and places of digital health technology use, I asked my participants if they were tracking their periods in specific spaces or places. Whereas a number of interviewees could identify specific places such as gynaecologists' offices, timing and bodily sensations seemed to play a more crucial role. Several participants stated to be checking their period apps when experiencing symptoms that might be related to menstrual cycles, when making plans or when engaging in sexual relations. As for the frequency of menstrual app use, it was difficult for my interviewees to provide exact numbers. Many participants reported on checking their period apps once or twice a week and several pointed out to be opening

their app more during menstruation and ovulation. My findings relate to the frequencies identified by Gambier-Ross et al.'s study (2018) on fertility tracking apps who state that most of their participants used the apps either once or twice a week or every few weeks.

Most menstrual apps provide a plethora of factors that can be tracked. In my study, and besides logging of menstrual dates, observation of emotions, ovulation, pain, sexual activity, and vaginal discharge were among the most popular categories. This coincides with the participants' main reasons and tracking practices. Overall, I could identify six key purposes: 1) observation of menstrual cycles in order to keep track menstrual cycle dates and lengths, and to prepare for future periods, 2) tracking of reproductive and overall health as regular menses were understood as a health indicator, 3) getting to know bodies and menses, which included being more aware, refining the participants' knowledge on menstrual cycles, and gaining insights on fundamental aspects of menstruation, 4) provision of reassurance regarding cycle-related sensations, feelings and experiences with varying outcomes, 5) use of menstrual apps as (complementary) contraceptives or in order to support conception, and 6) tracking with the aim of improving patient-doctor interactions. It is important to

mention here that many of the interviewees highlighted more than one factor. The findings relate to the results of other studies on menstrual tracking: in a study on women's reasons for and ways of menstrual tracking, Epstein et al. (2017) identify five principal characteristics which overlap with the results of the present study: bodily awareness, understanding of body and cycle, preparation, seeking pregnancy, and informing conversations with healthcare providers. Based upon an online survey with participants mostly from the US, Rubinsky and colleagues (2018) present similar reasons why women track their menstrual cycles via period apps: to keep track of and predict menstruation dates, to observe menstrual symptoms, to improve the communication with healthcare providers, and with the aim of tracking their fertile windows either to plan or prevent pregnancies. The findings of the above-mentioned study carried out by Gambier-Ross and colleagues (2018) on women's uses of and relationships to fertility-tracking apps highlight similar aspects: cycle observation, seeking pregnancy, inform fertility treatment, and contraception. Given the study's focus, the principal reasons for app use revolved around fertility tracking. Nevertheless, the authors report on other reasons for app use as well, including themes presented here such as preparation of periods

and tracking of hormonal mood swings. Further, the characteristics I have identified correspond to the findings of studies carried out on sex, fertility and pregnancy apps: to seek information and to raise awareness (Peng et al., 2016), and to monitor bodies as well as to gain reassurance through apps (Lupton & Pedersen, 2016b).

In the section on the main reasons and practices of app-supported menstrual tracking, I also briefly address some of the apps' specificities as well as consequences of digital observation of periods. A number of the interviewees pointed out to appreciate menstrual apps' constant availability, the automatization of the tracking process, as well as the fact that tracking via apps reduced the risk of losing menstrual data as compared to observation via paper calendars. These findings relate to Jacobson et al.'s (2018) observation that adolescents prefer period apps over paper diaries. The implications of the automatization of menstrual tracking processes is further discussed in the section on the transformations of bodies. As for the consequences, my study highlights positive as well as negative effects of app-supported menstrual tracking. Whereas some participants seemed to acquire new knowledge on menstrual cycles and gain reassurance on related symptoms, others reported on negative impacts, provoked for instance

by being confronted with large deviations between actual and calculated cycle dates. The consequences of app-supported period tracking are examined in further detail in the subsequent sections.

As evident from the present study, menstrual tracking practices changed over time: while a few participants stated to be planning to track more factors or collect more exact data in the future, others reported on having stopped observing certain categories. Partial cessation of tracking usually occurred when the participants had found answers to their questions or did not feel to be in need of an app for the respective purpose. It seemed that an increase of knowledge over time made some of the apps' features obsolete. Similar observations have been made by Peng et al. (2016) in their study on health apps. Further, this finding also relates to Pink et al.'s (2018) paper where the authors underscore the incompleteness, inaccuracy and dispersed nature of self-tracking data. Three of the interviewees had stopped tracking their cycles via apps completely. Whereas in one case cessation was involuntary and a result of the participant's health situation (amenorrhea/ absence of period), the other two ex-users raised privacy issues and stated not to be willing to invest work into period tracking. The phenomenon of discontinuous use of tracking apps has been

discussed by other scholars before (Didžiokaitė, Saukko, & Greiffenhagen, 2018; Gorm & Shklovski, 2019). Moreover, Smith (2016) points out that taking care of the virtual self can be understood as a form of labour, just as mentioned by the participant.

6.1.3 Alternatives and additional forms of period tracking

Several of the study's participants reported on using alternative or additional ways to observe their menstrual cycles. The use of other devices for menstrual tracking comes as no surprise given that app-supported menstrual tracking builds upon a long history of observation and analysis of period including the use of paper calendars and birth control chains facilitating the calculation of fertile and infertile days⁴. Some interviewees reported on having used other techniques to observe menstrual cycles before they started using apps. Here, paper calendars were the most common alternative. Moreover, for a number of participants menstrual apps alone were not sufficient to gain the information they were looking for: some engaged in additional activities such as the writing of a period (paper) diary and others

⁴ A collection of past and present menstrual tracking methods can be found on the website of the Museum of Contraception and Abortion: <http://en.muvs.org>

reported on reading books on menstruation. In some cases, apps were replaced by other means: two interviewees stated to have substituted their app by asking friends when they were due.

6.2 Shifts in Medicalisation

As mentioned in the introductory chapter, menstruation and related symptoms have received significant medical attention from the beginnings of Western medicine, rendering periods a prime example of the medicalisation of women's bodies and the transformation of sexual difference into disease. Given that technoscientific inventions have been demonstrated to play an important role in the shaping of processes of medicalisation (Clarke et al., 2003), the use of apps for period tracking - a relatively recent technological development - represents an interesting case to investigate potential effects on medicalisation. As highlighted in the findings, menstrual tracking via apps contributes to, questions, and/ or alters processes of medicalisation of menstruation and associated symptoms. In specific, I could identify three main aspects that experience shifts through engagement in app-supported period tracking: 1) app-supported menstrual tracking can serve as a means to control periods and bodies, 2) shifts in the interaction with healthcare professionals, and 3) app-supported menstrual tracking as a practice of health tracking.

6.2.1 Control and empowerment

In contrast to earlier accounts that understand medicalisation as a top-down process involving control, medical imperialism, surveillance and rational application, more recent scholarship offers models that pay attention to the complexity and contestability of processes of medicalisation (A. Bell, 2016). Nevertheless, medicalisation as a mechanism of social control (Conrad & Schneider, 1980) continues to be an important aspect when it comes to menstruation. As highlighted by Woods (2013), the association of menstruation with mental or physiological pain does not solely affect those suffering from these symptoms but renders all women unreliable and unstable human beings in need of control. In the present study, control, and in specific self-control, was a recurring aspect mentioned during the interviews. It was common among the participants to perceive menstrual cycles and associated physiological processes as painful and “out of control”. Many of the interviewees reported on different kinds of physiological and mental pain in connection to menstruation, as well as on limitations in everyday activities resulting from cycle-related symptoms. Among the most frequently mentioned side effects of menstruation were physical pain as well as mood swings and related powerful emotions

such as anger and sadness. Changes in emotional states were repeatedly assigned to shifts in hormone levels in the course of the menstrual cycle, whereas with differing conceptions: some participants expressed rather negative views, echoing some feminist scholars' findings who point out that menstruation is understood as "normal" but the hormonal flux is rendered a disease or problem (Delaney, Janice; Lupton, Mary Jane; Toth, 1988). Other participants, however, underscored the empowering potential of being in better knowledge of hormonal changes and their effects on everyday life, a perception that can be related to recent publications highlighting a shift in the understanding of hormonal fluctuations towards something beneficial if managed correctly (Haselton, 2018).

Against the background of understanding menstrual cycles as out of control or in need of control, menstrual apps seemed to represent a useful instrument to re-establish control over periods. Being in better control of cycles particularly related to the apps' function to predict upcoming periods and seemed to be especially useful for participants experiencing strong menstrual symptoms and irregular cycles. The tracking and prediction of future menstrual bleedings enabled the interviewees to prepare for upcoming periods and adapt accordingly.

An example given by one of the participants was putting on different clothes during menstruation, presumably to hide potential leaks or menstrual products they were using. In these cases, it seemed that period apps facilitated practices of menstrual concealment, thus potentially contributing to the widespread understanding of menstruation as a shameful process that needs to be hidden (Woods, 2013). The concealment of menstruation in order to appear “normal”, i.e. not menstruating, has been described by Vostral (2008), who terms this process “menstrual passing”. Vostral’s concept of menstrual passing also highlights the role of technology in practices of menstrual concealment - in this case, the tampon. Although concealment might contribute to the stigmatization of periods, Vostral underscores the potential empowering effect of menstrual passing. In my study, several of the interviewees reported on positive experiences when using menstrual apps: besides being able to better control menstrual cycle dates and symptoms, they stated to be calmer and feel less lost. This observation relates to Mamo and Fosket’s (2009) finding that empowerment and control are not necessarily opposite as often suggested by feminist discourses on medicalisation. The authors note that the experience of control depends on how it is exerted and under

which circumstances. This is also true for the present study as my participants' perceptions of controlling menstrual cycle dates via apps depended on factors such as the regularity of their cycles, and their expectations and experiences of period tracking. Further, and in contrast to other forms of controlling menstrual cycle dates – for instance through the intake of hormonal contraceptives – period apps do not require the inclusion of healthcare professionals. Hence, when engaging in menstrual tracking via apps, control is exercised predominantly by laypeople over their own bodies and menses.

In some cases, menstrual apps seemed to represent an alternative for hormonal contraceptives. There were some interviewees who had stopped taking hormonal contraceptives and had started tracking their menses via apps instead. For these participants, observation of menstrual dates and ir/regularities via apps seemed to represent a viable alternative to contraceptives regarding the control of period dates, providing them with the possibility to keep track of their cycles in a more “natural” state and supposedly free from any side effects. A few interviewees also reported on having stopped tracking their cycles via an app when they started to use hormonal contraception. For one participant it seemed that the menstrual app's depictions of cycle

irregularities was one of the reasons for starting hormonal contraception in order to regulate menstruation. Another interviewee reported on complementary use of a menstrual app and hormonal contraceptive, as they were controlling the efficacy of the contraceptive pill in regulating their cycles via their app. As evident from the examples mentioned here, menstrual apps can be understood as a novel development in a long row of menstrual technologies. From a theoretical perspective, there also seem to be continuities: given their potential for engagement in self-control, period apps can be conceptualized as Foucauldian technologies of bodily governance – an observation that has also been made for hormonal contraceptives by feminist critiques (Newton, 2016). As highlighted by Newton, there are also more positive accounts on contraceptives underscoring their role in achieving bodily freedom. The same is true for menstrual apps as emphasized by the participants. Indeed, it seems that these apparently opposite perceptions are not that contradictory keeping in mind Foucault's finding that self-observation includes self-reflection and the production of the modern self.

There are some publications highlighting the importance of control in the context of self-tracking that also draw upon Foucauldian concepts.

For instance, in a study on the Quantified Self movement, Ajana (2017) notes that the desire to feel in control represents the principal reason for engagement in self-practices. Drawing upon Foucault's notions of biopower and biopolitics, she states that self-tracking can be understood as a technique for managing life and everyday events – an observation that relates to my findings. Ajana distinguishes the kind of power that is enacted upon the body during self-tracking from other forms of power, pointing out that self-observation does not aim at discipline and coercion but rather on normalization and control. In the interviews of the present study, normalization, i.e. the concealment of periods and associated symptoms and practices, played an important role as well.

6.2.2 Patients, doctors, apps

As highlighted above, app-supported period tracking does not require medical assistance and thus can be carried out without the support of healthcare professionals. Nevertheless, the use of menstrual apps in the context of patient-doctor interaction was commonly mentioned in the interviews. Several participants stated to have been urged to track their cycles by healthcare professionals, either to control the efficacy and correct dosage of medication, or to support the decision on medical treatment. Here, app-supported period tracking seemed to facilitate the

diagnosing and treatment of health issues. Although none of the healthcare experts specifically recommended the use of an app for menstrual observation, tracking of period dates and symptoms via apps was experienced as particularly helpful by my participants. The interviewees found that menstrual tracking via apps provided them with more detailed as well as better structured data which facilitated the interaction with experts. A practice that was mentioned frequently during the interviews was to look up menstrual dates at gynaecologist visits. One participant who had suffered from a severe illness in the past also stated to be discussing their recorded symptoms with their doctor. As most interviewees reported on sharing their data via showing their apps to professionals and only a few knew about the option to digitally forward stored menstrual data to doctors, I asked them about their opinion regarding such a feature. Whereas the majority responded positively, some expressed privacy concerns and related discomfort.

Tracking of menstrual dates and cycle-associated symptoms in order to facilitate the communication with healthcare providers was also highlighted by other studies on period and fertility apps: Epstein et al. (2017) found that among users' motivations to track menses was to be able to inform doctors about menstrual cycle dates, and to discuss

unusual symptoms and irregularities. Further, some of the participants of this study reported to have started tracking upon recommendation of their doctors. In a study on fertility tracking apps, Gambier-Ross et al. (2018) point out that sharing data with healthcare experts was a major motivation of tracking. Moreover, they present one example of a participant who stated to share the data with their doctor in order to be taken seriously. The latter relates to the present study as also some of my participants underscored advantages of showing the data displayed by their menstrual apps to doctors. Indeed, it seemed that the main reason why menstrual apps facilitated patient-doctor interactions was the common understanding of digitally stored and illustrated data as more detailed and precise as well as better structured, thus making it easier for both, healthcare experts and users, to get an overview on the most important cycle-related aspects. The perception of the information provided by digital devices as more precise than the patients' accounts is likely to be a result of the widespread believe in the objectivity of processes of quantification and datafication (Espeland & Stevens, 2008; van Dijck, 2014). For app-supported menstrual tracking, the supposed impartiality of period apps and their algorithms appeared to play a particularly important role given that menses have long been (and

to a certain extent, continue to be) linked to women's supposedly missing ability to be objective (E. Martin, 1988). It seemed that menstrual apps turned "subjective" cycle-related experiences into "objective" symptoms – an aspect that seemed to be experienced as beneficial by several of the interviewees.

As highlighted by Maturo (2012), Conrad has suggested to pay attention to three main aspects of medicalisation: 1) conceptual medicalisation 2) institutional medicalisation, and 3) interactional medicalisation. The latter describes the translation of a social problem into a medical one by a doctor in interaction with a patient. For the present study this means that by logging symptoms and showing their apps to healthcare experts, the participants actively engaged in processes of medicalisation. In addition, when apps are being used to inform doctors, a novel - non-human - actor comes into play. Whereas one could argue that technology has always played a role in the diagnosis and treatment of illnesses, there are some important differences to consider: first, menstrual apps are technologies that are predominantly used in private realms. Second, these apps are usually developed by app design companies, often without having consulted healthcare experts (Lienhard & Legner, 2017). Given their presumed

objectivity, medical experts as well as laypeople are likely to place trust in menstrual apps' calculations and illustrations without taking into account inbuilt assumptions and norms⁵. Moreover, app-supported menstrual tracking does not solely lead to changes in medicalisation of menses but provokes shifts in related responsibilities. According to Ajana (2017), the recent rise of self-monitoring practices is part of a larger shift towards an increased neoliberal system of health care and management. For the author, self-trackers such as members of the Quantified Self community represent ideal neoliberal citizens as they view themselves and their bodies as projects in constant need of monitoring and improvement. Through self-tracking, responsibilities for health and healthcare are individualized and transferred to laypeople. By engaging in app-supported menstrual tracking, my interviewees are also more likely to assume the responsibility for cycle-associated symptoms and health. The fact that the engagement in self-control and the increasing self-responsibilisation was understood as empowering by many of the participants relates to MacGregor and

⁵ This aspect of menstrual tracking and the potential consequences will be discussed in more detail in the section on the transformation of bodies.

Wathen's (2014) observation that responsibility shifts are marketed under the name of empowerment, control and choice.

6.2.3 Tracking menses, tracking health

Menstruation and related symptoms were understood as connected to health by most of the study's participants. In specific, regular menstrual cycles were frequently perceived as an indicator for good reproductive and/ or overall health, and changes in cycle-associated symptoms were interpreted as bodily feedback to the current lifestyle by a number of interviewees. The understanding of menses as a sign for health status is not limited to laypeople such as my participants but has become increasingly popular also among healthcare providers. For instance, the evaluation of menstruation in adolescents in order to identify potential health concerns has been suggested by the American College of Obstetricians and Gynecologists (2015). As stated by the committee, menstrual cycles should be included in clinicians' assessments as an additional vital sign next to other indicators such as blood pressure, heart rate and respiratory rate. The preventive approach to health presented in the results can be framed by Armstrong's (1995) concept of surveillance medicine. As highlighted by the author, "in Surveillance Medicine each illness is simply a nodal point in a network of health

status monitoring. The problem is less illness per se but the semi-pathological pre-illness at-risk state' (401)".

Further, the finding that regular cycles were perceived as an indicator for good (reproductive) health relates in several aspects to Marshall's (2010) study on sexual function and healthy ageing. The author notes a similar relationship between ageing and sexuality given that sexual function has become an indicator for general health, particularly in men's mid-to later life. Marshall then goes on to identify a row of consequences of this shift: the "*re-sexing*" (215, emphasis in the original) of ageing bodies based upon heteronormative assumptions, the resulting understanding of ageing bodies as in need of monitoring, management and potential treatment, changes in the understanding and experience of sexuality, as well as a shift in what is perceived as "normal" ageing. Processes of normalisation, and the growing self-responsibilisation through app-supported menstrual tracking are examples of changes in the understanding and experience of menstruation in my study. Regarding sexuality, the present study found that app-supported tracking of menstrual dates in order to observe reproductive health was not limited to heterosexual users. This observation stands in contrast to what one would expect looking at the

gendered design of many period apps (see chapter 5.5 on gendered design), which appears to rather reinforce heteronormative assumptions about menses. Marshall also highlights that in the context of sexual health and ageing, functional and dysfunctional have taken the place of normal and abnormal. Several of the statements presented in my study echo Marshall's observation as app-supported tracking often appeared to strengthen the participants' perception of their cycles as regular or irregular, whereas the latter was commonly understood as "abnormal" and potentially pathological. According to my participants' reports it seemed that menstrual tracking via apps often reinforced the perception of regular cycles as "normal". This stands in contrast to biomedical research showing that irregular menses are common and do not necessary represent an indicator for health problems (Munster, Schmidt, & Helm, 1992; Treloar, Boynton, Behn, & Brown, 1967). Or, as one of the healthcare experts in Granada has put it, "the only regularity regarding menstruation is its irregularity." (Barranco, interview, 11.11.2016).

The impact of app-supported period tracking on the experiences and understanding of menses was not limited to cycle ir/regularities but also included other tracking categories provided by the apps. As noted

above, the presence of certain tracking factors such as those connected to pain and pain management reinforced several interviewees' understanding of menses as painful and debilitating. Indeed, not being confronted with severe menstrual suffering was highlighted as exceptional and good luck by one of the participants. It is interesting, however, that despite the tracking categories and functions period apps offer, most of the participants did not consider them to be health apps or providers of health information. Actually, most interviewees rejected the use of health apps in general, mostly because of privacy concerns as they understood health-related information as sensitive.

6.3 Transformations of menses and bodies

The findings show that app-supported period tracking leads to shifts in users' understanding of menses and bodies as novel connections are being established between users, apps and digital data. In the following, these aspects are discussed relating my observations to other studies on self-tracking as well as accounts from critical data studies and theories aiming to grasp body-technology interactions.

6.3.1 Shifts in tracking, shifts in understanding

An important difference of menstrual apps as compared to other forms of period tracking is their constant availability and ubiquity. As pointed out by the study's participants, period apps can be accessed at almost any given time and in any location. The resulting expansion of the temporal and spatial scope of period tracking had an impact on how the interviewees perceived their menstruating bodies and selves. For instance, the statements of several participants conveyed an understanding of menstrual observation as a project requiring constant monitoring. This perception was further strengthened by some of the apps' functions, such as instant pop-up messages which repeatedly reminded the interviewees to log their cycles and symptoms. Moreover, certain features such as the prediction of premenstrual symptoms or the

calculation of upcoming menstrual dates appeared to lead to an increased perception of menstrual tracking as directed towards the future. These observations echo the findings of other studies on the effects of engagement in self-tracking: for instance, Ajana (2017) points out that self-tracking practices lead to an understanding of bodies as projects that require constant monitoring and as a consequence turn users into ideal neoliberal citizens following an ethos of self-government and self-management of health. In a study carried out with members of the Quantified Self community, Sherman (2016) underscores that self-tracking practices are commonly perceived as in constant development and oriented towards the future. This can include the desire for more tracking as highlighted by one of my participants who expected to improve their knowledge on their cycles through closer monitoring via apps. Further, in a study on users' experiences of heart-rate monitoring, Ruckenstein (2014) notes that people engaging in self-monitoring practices can be understood as in a constant state of becoming, motivated by a longing for more tracking.

Besides predicting future symptoms and periods, menstrual apps also provide users with their menstrual history including past period dates and data on cycle-related symptoms, as well as statistics and/ or

illustrations of average cycle lengths. My participants reported on several situations where they were confronted with discrepancies when comparing the information saved by the apps with their memories. In these cases, the interviewees tended to rely on their apps' recordings rather than their own memories. This behaviour relates to Bossewitch and Sinnreich's (2013) observation of a shift where people increasingly rely on machines as "cognitive prostheses" (226). As highlighted by the authors, digital memories exceed the knowledge people possess about their bodies and selves, and progressively replace their memories and experiences. Hence, the authors conclude, users are confronted with an ontological crisis which challenges the understanding and the construction of their identities. However, in the present study, only some interviewees appeared to be disconcerted when confronted with discrepancies between their own and the apps' memories, and most participants stated to appreciate the stability of their menstrual records provided by period apps.

Due to the plethora of categories that can be tracked and analysed, menstrual apps broaden the range and depth of period tracking. For a number of interviewees, the variety of symptoms that can be logged led to the establishment of novel associations with menstruation as they

related novel symptoms with their cycles. Overall, it seemed that app-supported tracking helped increase the participants' knowledge on menstruation. On the other hand, however, menstrual app users might be tempted to associate all kinds of symptoms with menstruation, thus overlooking other causes for health issues.

During app-supported menstrual tracking, users are provided with instantaneous visualizations of their cycles and related symptoms. The immediate availability of the collected data was a frequently mentioned aspect of period tracking and seeing menstrual data played an important role in the verification of the participants' sensations and experiences. According to Lupton (Lupton, 2013a), the visual depictions of the body through digital mobile technologies can be understood as an extension of visualization technologies in medicine, and hence as a part of a more general shift from haptic to optic recording of bodies. Following Duden, she points out that the visual is commonly understood as the truth, and often perceived as more objective than the patients' own perceptions. Lupton notes that bodies become spectacular and "transparent" (398) as their interior is not only displayed and made visible, but bodies are turned into knowable and manageable projects seeking perfection. Lupton's observations were reflected by some of

the statements in the study, as a number of participants prioritized the apps' depictions when comparing them to their own impressions. As highlighted above, tracking of menstrual cycles via apps was often perceived as a means to know more. Similar observations have been made by other empirical studies on self-tracking: Ruckenstein (2014) reports that the members of the Quantified Self community understood their devices' data visualizations as more factual than their subjective experiences. Similar to Lupton, she notes that this relates to the common conception that seeing makes information more credible. Furthermore, Ruckenstein points out how an increase in visibility entails the responsibility to act. In fact, in the context of rising healthcare costs, apps for self-tracking can be understood as technological solutions supporting the promotion of self-care and thus a shift of responsibilities from healthcare professionals to lay people (Ballard & Elston, 2005).

Objectivity represents another important aspect in app-supported menstrual tracking. As has been shown by socio-scientific studies on algorithms and digital data, it is the widespread belief in the impartiality of quantification and datafication processes that makes users place trust in the devices that collect, interpret and provide digital

data (Espeland & Stevens, 2008; Gillespie, 2014; van Dijck, 2014). This is confirmed by the present study as most participants understood menstrual apps as instruments that provide them with an objective truth about their bodies and menses. However, it has been demonstrated that algorithms carry specific values (Gitelman, 2013) and to build upon certain conventions which include gendered, biomedicalised, classed etc. assumptions (Mackenzie, 2005). These inbuilt norms are often difficult to grasp as algorithms are usually inaccessible to app users, often due to market reasons (Gillespie, 2014). As for the present study, menstrual apps seemed to strengthen discourses and associations of menstruation with reproduction and female gender.

The supposed objectivity of menstrual apps is not solely a result of the design of menstrual apps, but also users play an active role in the abstraction of the data that they enter. In order to make the information machine-readable, a certain abstraction, adaption and simplification of experiences and sensations is required. Whereas these processes were often carried out unconsciously, some participants noted difficulties to translate their experiences into the apps' categories and consequently stopped tracking the respective factors.

6.3.2 Ties linking users, menstrual apps and data

As noted by Ruckenstein (2014), the engagement in digitized self-monitoring practices transforms bodies into information. In the case of menstrual tracking, physiological, mental and behavioural aspects related to menstruation are being translated into digital data flows, which are then (partly) fed back to users via graphical depictions. In the interviews, the participants reported on a range of connections that were being established between bodies, apps and menstrual data. These resulting amalgams can be framed drawing on the concept of assemblage, which Lupton (2013b) describes as the “idea that human bodies are viewed as complex and dynamic configurations of flesh, others' bodies, discourses, practices, ideas and material objects”. Taking up Haraway’s cyborg and linking it to the concept of assemblage, Lupton notes that new digital health technologies such as apps for self-observation give rise to a new kind of being which she terms “digital cyborg assemblage”. Lupton highlights that the digitally engaged patient can be understood as a combination of text, machine, body and metaphor, involved in practices of self-examination, surveillance and improvement. Given the sensory, emotional and cognitive ties that are being established between users, apps and their

data, also app-supported period tracking can be understood as giving rise to digital cyborg assemblages. As already mentioned, my participants reported on a range of linkages whereas the extent to which they felt connected to their apps varied. For several interviewees, the physical closeness between their bodies and menstrual apps seemed to depend on their apps' capacity to correctly predict cycle dates. Hence, accurate prediction of upcoming periods promoted a feeling of closeness whereas considerable differences between predicted and actual menstrual dates seemed to weaken this connection. Given that period tracking via apps also includes the observation of physical and mental factors associated with menstruation, many participants seemed to establish sensorial ties to their apps through comparing data visualizations with bodily and emotional sensations. In a study with members of the Quantified Self community in Denmark and everyday self-trackers from Germany, Kristensen and Prigge's (2018) present a similar finding. The authors highlight how self-trackers associated visualizations generated by their devices with a feeling of the bodily self. Drawing on post-phenomenological literature, the authors note that devices for self-tracking were perceived as concrete extensions of the human body, thus broadening its sensory apparatus. Whereas the

participants of my study reported on similar experiences, my own perception of the establishment of sensory ties was not limited to visual stimuli. As evident from my autoethnographic notes, also haptic interaction with menstrual apps promoted the creation of a link between my body and one of the period apps I was using. The importance of the role of hands in the study of mobile devices has been highlighted by Pink et al. (2016): following Marks' conception of "haptic visuality" (243), the authors note that eyes can be conceptualized as organs of touch, and stress the utility of understanding touch and vision as intertwined sensory modalities of knowing, learning and sensing.

Menstrual apps do not only provide users with features to track their emotions but period tracking per se leads to different kinds of feelings as highlighted frequently by the interviewees. This relates to Pink et al.'s (2016) observation that the use of mobile devices is not solely a sensory but also an affective experience. According to the authors, "[p]utting one's finger on the screen does not only open apps, but invokes feelings of connection with people, experiences, and activities." (247). The establishment of linkages to other people was also pointed out by a number of my participants. For instance, one interviewee compared their menstrual cycle-related experiences to the

available tracking categories, thereby deducing other users' potential sensations. Moreover, some menstrual apps actively promote the creation of connections between different app users and other people involved as they offer features that enable users to share their cycles with friends, intimate partners, other users, or healthcare professionals. The connections established between users during self-tracking can be framed within Rabinow's concept of biosociality, which describes how biological findings work as cultural determinants (Ene, 2009). Taking the example of the Human Genome Project, Rabinow discusses how the sharing of certain genetic make-ups and predispositions for diseases could foster novel forms of solidarity and networks among people sharing the same genes, and thus could lead to new forms of social identities. The concept of biosociality was further refined by other authors: Hagen (2017) expands Rabinow's concept to the digital realm and coins the term "digital biosociality" to describe a shift towards novel biosocialities emerging out of social media and the internet. Ajana (2017) refers to Rabinow's and Hagen's conceptions in order to highlight how self-tracking increasingly becomes a socialized phenomenon, linking individuals through the sharing and comparing of data and results. Although my participants did not engage in (voluntary)

digital data sharing when tracking their cycles, statements highlighting practices such as comparing own symptoms with the available categories and thereby deducing other users' experiences relate to the conceptions presented here.

The feelings involved in app-supported tracking covered a wide spectrum reaching from reassurance to enhanced stress and insecurity. As mentioned by Oudshoorn (2016), self-tracking can lead to novel vulnerabilities and dependencies, an observation that relates to the statements given by several of my interviewees. In any case, the emotions involved in app-supported period tracking seemed to strengthen user-app connections. For instance, some interviewees seemed to regard their menstrual app as an intimate companion with whom intimate information can be shared, a finding that relates to Ajana's (2017) observation that mobile devices can take on the role of a friend. Another interesting aspect of menstrual tracking concerns the co-development of period apps and users. As for my study, the use of menstrual apps did not only have an impact on the participants' perceptions and experiences but also affected the apps as their algorithms adapted to their users' recordings. One example was given by a participant who noted that their app stopped predicting ovulation

days after experiencing a menstrual cycle irregularity. Further, in the course of the study, several apps changed their design, partly resulting from users' feedback as highlighted in my autoethnographic notes. The interaction presented here can be understood as a kind of co-evolvement of users and period apps. As pointed out by Lupton (2016a), when people and technologies interact, they influence each other, learn from each other and thus co-evolve.

6.4 Privacy and surveillance: impressions, strategies, affects

As highlighted by scholars from the field of surveillance studies, surveillance represents an almost unnoticed yet important part of contemporary societies (Bauman & Lyon, 2013; D. Ellis et al., 2013). During app-supported menstrual tracking, users enter intimate corporeal and emotional information into apps, potentially making them vulnerable to increased surveillance and data misuse. The interview questions comprised a section on privacy and surveillance in the context of menstrual tracking. The present chapter discusses the participants' opinions on these issues drawing on conceptions from surveillance studies and on literature exploring the affects involved in digital data creation and sharing.

6.4.1 Laborious privacy policies

When downloading an app for menstrual tracking, users are commonly asked to read through and agree to the app's privacy policies and terms and conditions. Among the participants of the present study only few reported on having read these documents, whereas most stated to either have quickly skimmed through the text or to have accepted after a brief attempt of reading. This approach seemed to be understood as

widespread and “normal” and echoes Esposti’s (2014) remark that customers tend to sign contracts without reading and thus approve data processing without being fully informed. The interviewees often pointed out that the contracts were too long and laborious to be read entirely. This point of view was even expressed by experts such as a legal practitioner. It was common that the interviewees could not recall approving or having read any contract, and several assumed to have given a global approval to all apps available in app stores when they had started using their smartphone. Several participants highlighted the lack of options when it comes to privacy policies as apps can only be downloaded when agreeing to their conditions. This relates to Esposti’s (2014) observation that concerning the use of data, customers and companies are in an asymmetrical relationship where users are forced to agree to the terms and conditions in order to participate. There was one participant who temporarily interrupted the installation of their menstrual app because of privacy concerns. However, a couple of days later the same person decided to use the app arguing that they were already using other apps potentially violating their privacy to an even greater extent. Some interviewees understood the apps’ granular permission models (pop-up messages offering users to grant or deny

access to particular functions when needed) as an improvement of the long and laborious legal texts usually provided by apps. However, this relatively novel mode of access authorization does not replace apps' general terms which include property and usage rights. Hence, it seemed that the different kinds of legal documents the participants had to agree to led to confusion rather than simplification.

6.4.2 Selling and sharing the self

As highlighted by van Dijck (2014), the exchange of data for services has become normalized, turning digital data into a novel currency. Van Dijck also notes that most people are not willing to pay for privacy. Van Dijck's observation is also valid for my study: among the participants, only two reported on having paid for the menstrual app they were using, all the others were using apps that were free of charge. The two interviewees who used a paid version of a period app, stated other reasons for their choice than increased privacy protection. Thus, it seemed that the participants did not even contemplate the option of paying for more privacy. The perception of data as currency was reflected by the wording used by many of my interviewees. Expressions such as "selling your data" and "selling yourself" were commonly employed.

In discourses on privacy and security, the two terms are often juxtaposed, understanding them as mutually exclusive. In fact, privacy is often seen as the price one has to pay for security. As has been underscored by Ajana (2017), the privacy versus security discourse arising in the aftermath of 9/11 has come to influence the field of healthcare and biomedical research in recent years. The contrasting of privacy and security was also common among my participants, although with some doubt in several cases. It was frequent that the interviewees highlighted that they had “nothing to hide”, most likely with the aim of relativizing the severeness of surveillance on a personal level. Further, the “nothing to hide” discourse points to an understanding of privacy as associated with the concealment of negative aspects. This perception echoes Ajana’s finding that privacy is often associated with selfishness and concealment of negative aspects. In addition, a number of interviewees mentioned not to be fully aware of the further use of their digital data they feed into menstrual apps. This relates to Ellis et al.’s study (2013) where the authors point out that being ‘not-that-conscious’ represents one of the dominant discourses in surveillance societies.

When talking about privacy, anonymity - commonly defined by the participants as concealment of their name and eventually other personal information such as date of birth - was commonly mentioned as one of the most important aspects concerning privacy issues during menstrual tracking and digital media use. Noting that privacy needs to be redefined in contemporary contexts of dataveillance, Rosenzweig (2012) argues for conceptualizing privacy as a construct to protect other important values such as anonymity.

It was common that the interviewees underscored the willingness to share their menstrual data for scientific purposes, and thus conveyed an understanding of tracking data as an important resource in the generation of new knowledge and the advancement of biomedical research. This relates to a phenomenon which has been termed “data philanthropy” and designates that data sharing is increasingly perceived as beneficial to the public, thus promoting a growing imperative to participate in processes of data gathering and sharing via tracking technologies (Ajana, 2017). Although data sharing for scientific reasons was perceived positively, there remained a certain unease as several participants contemplated the possibility of data misuse. As

emphasized by Ajana, data sharing often leads to tensions between data sharing and issues of ownership, commercialization and privacy.

While data sharing for research was understood as beneficial, the participants rejected the provision of information for marketing reasons. Nevertheless, it was common that the interviewees acknowledged the selling of tracked data for marketing as a fundamental and unavoidable aspect of today's digital economy. This finding relates to van Dijck's (2014) conception of data as a novel form of currency as mentioned in the beginning of this section.

Marketing, or more precisely advertising on smartphones and computers also played an important role in my participants' discourses on privacy and surveillance. Several interviewees understood the sudden appearance of ads as a confirmation of being surveilled and/or data transfers between different websites or companies. Whereas some participants stated to be concerned about being wiretapped, several highlighted to feel monitored predominantly during internet searches. In both cases the interviewees reported on being provided with advertising relating to the products or services they had been talking about or searching for shortly before.

The participants' frequent mention of marketing in the context of data sharing confirms the findings of economics and social science scholars underscoring the widespread use of data analysis for marketing reasons. Analytical interventions are often used for consumer profiling (Haggerty & Ericson, 2000) and to maximise revenue (Esposti, 2014). Esposti notes that the trade and use of personal data for marketing reasons is frequently based upon customers' lack of awareness regarding the actual processes that take place during data analysis and processing. Indeed, the interviewee with expert knowledge in the field of marketing was among the most critical concerning practices of data sharing for marketing reasons. The finding that marketing was commonly understood as a fundamental and unavoidable aspect of today's digital economy relates to Esposti's observation that users largely accept the exploitation of their data with the aim of directed marketing. Esposti underscores potential discriminatory effects of data analysis practices, giving as an example the adjustment of insurance fees according to the consumer's grocery purchases. In the present study, something similar was highlighted by one of the participants who stressed the potential discrimination of people suffering from health issues if their data were disclosed to insurances or employers. Further,

in the case of menstrual tracking, marketing seems to have reached a whole new level as companies rely increasingly on “biological marketing”, an approach that adapts its strategies according to people’s cycle phase (Green et al., 2019). Given that this aspect has been reported on only recently, biological marketing did not form part of the interview discourses.

6.4.3 Responsibilities and Strategies

In the interviews, the participants were asked who was responsible for the secure management of their data. Whereas most interviewees stressed the self-responsibility of app users, several also underscored the role of developers in processes of privacy protection and surveillance. Most commonly, the participants understood users as primary responsible and ranked developers second. Nevertheless, there was also a number of interviewees who pointed to the unequal situation between users and developers regarding access to data and related literacy. Several participants stressed the difficulty to escape from digital data production and sharing in an internet-saturated world. Contrary to van Dijck’s (2014) observation that people commonly call for government action regarding the provision of data privacy, there was only interviewee who mentioned the government, highlighting the

role of the state as an agent of surveillance. The interviewee underscored the potential transfer of sensitive health data to the private sector including insurance and pharmaceutical companies. The same interviewee also reflected upon varying consequences of the sharing of health data for people in different life situations, stressing potential harmful effects on users who suffer from poor health. This consideration relates to Lyon's (2014) finding that varying social backgrounds affect people's experience of surveillance, a mechanism the author terms "social sorting". While a small number of the other participants voiced similar thoughts, nobody considered that the privacy of their individual data might have implications on a broader societal level. Surveillance was commonly understood as having a potential negative impact on the individual level. In contrast to my findings it has been shown that privacy violations do not necessarily target individuals but can have a significant impact on the society as Big Data practices support the further categorization of people and therefore the potential discrimination of certain groups or individuals (Ajana, 2017). Ajana's findings have important implications for my study, as people engaging in the collection and sharing of menstrual data via apps are likely to contribute to processes of normalization as

well as the exclusion and invisibilisation of certain individuals such as people who cannot or do not want to track their menstrual cycles for health reasons.

Whereas it was common that the interviewees relativized the risks of data sharing and surrendered, some of the participants mentioned strategies to counter surveillance and maintain a certain level of privacy. The most common approach was limiting the information they were sharing. This included concealment of personal data, not sharing pictures of children, or taping cameras on notebooks and televisions. Participants with an elevated level of digital literacy stated to have deactivated GPS (Global Position System for determination of geolocation) on their smartphones and one interviewee reported on having used an internet-free computer. In the autoethnography there were also situations when I decided not to log certain aspects into my apps as a strategy to protect myself. Only one participant highlighted to use the internet as a space for feminist activism, an observation that relates to Koskela's (2004) notion of "*empowering exhibitionism*" (207, emphasis in original), describing the process when users claim copyright to their lives and employ visibility as an instrument to counter shame and privacy.

6.4.4 Immediate Surveillance

The participants' accounts on surveillance were not limited to monitoring and data-processing actions at a distance but also included other forms of surveillance involving their immediate, everyday life environments. Several interviewees were concerned of being monitored by others who look at or gain access to their smartphones and thus menstrual apps. They mentioned to appreciate abstract icons for period apps in order to prevent others from knowing they were using a menstrual app. Other interviewees reported on using a password to stop others from accessing their period app's content. Hence, it seems that menstruation and related information continue to be considered an aspect of life that needs to be concealed. Whereas feelings of shame seemed to be common, not all the interviewees felt the urge to hide their menstrual apps and data. For instance, some participants mentioned to be using their apps also in public spaces where other people might observe them.

Some of the accounts on immediate surveillance referred to experiences that went beyond period tracking. For instance, one participant highlighted to feel surveilled by their mother who was checking their online activity via a messaging service app. Another participant

reported on situations where their ex-partner was going through their apps in order to control their social contacts, thus mentioning a case of intimate partner violence. In addition, some participants also identified the interview as a form of data sharing. Indeed, as highlighted by van Dijck (2014), also academics need to reflect upon their role in processes of data generation and processing and play an important role in building trust.

6.4.5 Affects of Surveillance

In order to identify the affects present in surveillance societies, Ellis et al. (2013) suggest paying attention to the ambiguities and conflicts in interviews. According to the authors, affects are “not yet conscious” (720) and thus expressed through speech acts such as disruptions and hesitations rather than specific terms. In the interviews of the present study, many of the elements described by the authors were present. For instance, most of the extracts conveyed a feeling of unease and uncertainty, often expressed through laughter, moaning and questioning or relativization through expressions such as “probably” or “I’m not sure”. Most participants mentioned a feeling of being overwhelmed when of reading and agreeing to menstrual apps’ terms and privacy policies. Some interviewees highlighted not to remember

the process of approving their apps' privacy policies which might indicate its level of normalization or represent a strategy of active suppression of inconvenient feelings.

When talking about responsibilities regarding data sharing, a number of the interviewees expressed a feeling of powerlessness against app developers and other, usually not further specified agents involved in data storage and processing. In the same context, one interviewee mentioned to be annoyed. Assumption of self-responsibility was commonly expressed via formulations such as "I have never completed anything." Associated therewith was often a feeling of unease for not reacting correspondingly.

Drawing on Lupton's (2017) work on affective atmospheres, the interviewees were specifically asked for their feelings regarding privacy violations and surveillance. Common expressions were "frightening", "worrying", "strange" and "spooky". Further, the participants reported on ways to emotionally manage their insecurities and justify their use of menstrual apps. Among the most common strategies were de-individualization of the responsibility for one's data privacy by extending it to other users, a no-choice discourse highlighting the asymmetrical relationship between users and

developers, the mention of a health-related dependency on period tracker apps, and situating the issue of privacy violation during menstrual tracking within a wider – more problematic and thus relativizing – context.

6.5 Perceptions of and responses to gendered menstrual app design

As highlighted by scholars of Science and Technology Studies, technological inventions can be understood as a result as well as a source of the social context they are created and used within (Latour, 1993). Given the widespread association of menstruation with female sex/ gender, heterosexuality and reproduction, the interviews comprised a section exploring the participants' experiences of and responses to (potentially) gendered period app design. The following chapter is divided into two sections. The first draws upon the gender script approach (Oudshoorn et al., 2002) to examine the interviewees' deciphering and interpretation of aspects of gender in menstrual apps' graphic design and their functions and workflows. The second part aims to capture menstrual app users' agency and their active role in the shaping of technology by making use of the domestication approach, developed by Silverstone and Hirsch. Further, it briefly addresses the intertwining of doing gender and technology.

6.5.1 Deciphering gender scripts, inscribing gender

As highlighted in the introductory chapter, the gender script approach represents one of the most prominent concepts to analyse the gendering of technological objects. Based upon the concept of the technological script by Akrich, the gender script approach examines how artefacts become gendered through designers' inscription of their visions, and how this gendering of artefacts impacts users' experiences and practices (Oudshoorn et al., 2002).

As for the present study, the participants identified two main ways in which gender scripts embedded in menstrual apps contributed to the reinforcement of gender norms and values: 1) strengthening of associations of menstruation with womanhood and femaleness through the apps' feminized graphic design; 2) reinforcement of gender and heteronormative assumptions regarding menstruation and reproduction through gendered characteristics embodied by the apps' workflows and functions. Regarding the graphic design, bright colours, decoration, flowers and baby animals evoked associations with femaleness. When asked to envision menstrual apps designed for cis men, they were frequently imagined to contain aspects commonly understood as

masculine such as dark colours, machines and elements associated with sexuality and violence. It is interesting however that participants using menstrual apps with more gender-neutral graphics were less likely to inscribe masculine characteristics into cis men's period apps. The participants' reactions to feminized graphic design varied: whereas some interviewees expressed either indifference or enjoyment regarding the feminized design of menstrual apps, others highlighted to prefer a more neutral design. Similar reactions have been identified by Gambier-Ross and colleagues (2018) in their study on fertility-tracking apps. Further, in the present study, some of the participants went beyond their individual experiences and highlighted the potential negative impact feminized menstrual app design might have on others such as users with trans-identities.

When asked about their ideas concerning the design of imagined cis men's period apps, the participants – and especially those who were using an app employing a feminized design – came up with a wide range of ideas how masculinity would be inscribed. Besides suggestions of changes in menstrual apps' graphic design, several interviewees envisioned modifications of the apps' functions. Similar to their responses regarding the graphic design, many interviewees stated

that the apps' features would draw upon common binary associations with gender, such as emotionality as a female trait and scientific facts or competitive thinking as masculine⁶. Moreover, several participants expected cis men's menstrual apps to meet higher standards, thus indicating disparities in status between genders. Examples given were the requirement of cis men's apps for more scientific data or improved workflows in order to make period-tracking more professional and less time-consuming. Through assumptions highlighting that cis men would not invest less time (if at all) into period tracking, the interviewees seemed to address the gender-specific division of labour, presumably understanding menstrual, reproductive and emotional work as female tasks. In fact, it has been shown before that technological artefacts tend to contribute to the gender/ sex specific division of labour (Faulkner, 2001). This especially concerns medical and reproductive technologies as they are commonly designed for women.

⁶ For the reinforcement of (gender) binaries through science and technology see for instance Haraway, D. (1989). *Primate Visions: Gender, Race, and Nature in the World of Modern Science*, New York: Routledge.

6.5.2 Domesticating menstrual apps

The domestication approach, developed by Silverstone and Hirsch represents a popular theoretical concept to grasp users' active role in the shaping of technological inventions (Oudshoorn et al., 2002). Via symbolical as well as practical work (Lie & Sørensen, 1996), users can transform, change or reject pre-inscribed meanings of technology, which potentially leads to “*unintended* consequences” (Faulkner, 2001: 83, emphasis in original).

Even though some menstrual apps offer users to choose between different background images and colours, options for adaption of their graphic design are rather limited. As a result, the participants who were not satisfied with the gendered scripts graphics engaged in practices of domestication either through accepting, rejecting, or – as in few cases – reinterpreting period apps' feminized design. For instance, some interviewees stated not to understand colours commonly associated with femaleness as limiting other genders from using them. However, others reported to have changed to a menstrual app employing a more gender-neutral graphic design.

Flexibility seemed to be higher concerning menstrual apps' features and workflows. The interviewees reported on practices of modification

such as the establishment of novel correlations between menstruation and mental or physiological factors, hence broadening the rather narrow understanding of menstruation as exclusively related to reproduction. Also, tracking of ovulation dates was not limited to heterosexual users potentially challenging associations of menstruation with reproduction and heterosexuality. Further, the widespread correlation between technology and masculinity opened up the possibility for a non-binary participant to engage in menstrual tracking. Although used by only few participants and over short periods of time, the option provided by some period apps to create own tracking categories points to the potential to incorporate (predominantly female) users in design processes thus going beyond re-signification and alternative uses. The creation of novel tracking categories might lead to the generation of a bigger - and potentially more inclusive - variety of factors for observation. The role of technological objects in the enactment of gender identities has been pointed out by technofeminists such as Wajcman (2009) and Actor Network Theory (ANT) concepts such as Latour's theory of action have opened up the possibility of specifically focusing on the changing processes of gender and technology (Lagesen, 2015). Lagesen (2012) describes the process of doing gender through technology (and vice

versa) as an ongoing process of making and unmaking of bodies, technologies, identities, and norms, as a “reassembling of human and non-human elements” (443). As for the present study, practices highlighted here such as the re-signification of menstrual apps' gendered graphic design, the disassociation of ovulation with heterosexuality, and the masculinization of menstrual tracking, can thus be understood as ways of doing gender through menstrual apps.

The domestication approach also mentions the option of complete rejection (Oudshoorn et al., 2002). In the present study, two interviewees had stopped app-supported menstrual tracking due to privacy issues and the required workload. As mentioned above, technological artefacts can reinforce the gendered division of labour, turning menstrual and reproductive work into exclusively female tasks (Lie, 2002). The rejection of this work can thus be interpreted as a form of resistance to meet gendered norms regarding the division of labour. Privacy, a subject discussed in more detail in the respective chapter, can also be understood as an important aspect in the gendering of technology. Menstrual apps collect vast amounts of intimate data, whereas women are predominantly data creators while men (developers) engage in the collection, interpretation and further

processing of the data. This gendered division of the so-called “Big Data poor” and “Big Data rich” (boyd & Crawford, 2012: 674) is likely to contribute to a strengthening of power imbalances between men and women. Moreover, it has been shown that privacy-specific harms have a different impact on people with varying sociocultural backgrounds, with vulnerable groups at greater risk of surveillance and data misuse (Mateescu, Rosenblat, & Boyd, 2016). As a consequence, the identification of privacy concerns and consequential rejection of app-supported period tracking by a couple of interviewees can be understood as a practice of resistance regarding not only the gendered division of labour but also gender power imbalances concerning privacy issues.

7 CONCLUSIONS

Drawing upon a qualitative interview study with period app users from Austria and Spain as well as an autoethnography documenting my experience of using several menstrual apps, the present dissertation illustrates the everyday practices and experiences of app-supported menstrual tracking in the European context. Overall, the thesis provides four main contributions. First, the findings presented here contribute to filling the gap in empirical studies on the lived experiences of (menstrual) self-tracking by “ordinary” people, i.e. users that are not part of the Quantified Self community. Second, the dissertation adds to research on the (trans-)formation of sociocultural inequalities, especially regarding research on the digitization and quantification of everyday life. Third, it highlights the importance of qualitative research by contrasting empirical findings with theoretical accounts on digitization and quantification processes. Fourth, the thesis’ findings indicate how an equality-promoting menstrual/ health app might look like.

By focusing on five major aspects of app-supported period tracking, the dissertation gives first insights into practices and experiences that have received little scholarly attention so far. For instance, I report on users’

approach of selecting a specific menstrual app, I find that most users engage in app-supported period tracking over longer periods – an observation that stands in contrast to the results of other empirical studies on self-tracking behaviour - and I highlight that menstrual tracking via apps cannot be replaced by paper calendars or diaries only but also by comparing cycles with friends. Some of the chapter's findings confirm the observations of previous studies on menstrual/fertility tracking apps and health apps. This includes the most popular reasons for and practices of app-supported period tracking and shifts in tracking behaviour over time.

Further, the dissertation presents three main aspects of medicalisation and discusses shifts and continuities that arise from the use of apps for period tracking. The findings demonstrate that menstrual apps can be used as devices for menstrual management and highlight the empowering aspect of being in control of bodies and periods. On the other hand, however, it also becomes evident that period tracking via apps can strengthen negative perceptions of periods as menstrual apps can support practices of menstrual concealment. The section also examines the interaction of app-supported menstrual tracking and the intake of hormonal contraceptives with the aim of controlling menstrual

cycle dates and ir/regularities and finds that these two modes can be used interchangeably as well as complementary. The observation that some participants had replaced hormonal contraceptives with period apps might indicate an ongoing shift from hormonal to digital contraception and menstrual cycle management, a development that is worth further investigation. The findings also point to changes in processes of medicalisation towards practices of self-control and self-responsibilisation outside traditional healthcare contexts. The role of menstrual apps in interactions with healthcare experts represents another important aspect. The results show that period apps facilitate interactions with healthcare professionals and have the potential to support the diagnosing and treatment of health issues that go beyond menstrual and reproductive health. Against the background of the widespread perception of menstrual cycles and associated symptoms as subjective – in fact, menstruation continues to be understood as one of the reasons for women’s supposed irrationality and inferiority – the findings demonstrate that menstrual apps can function as instruments to turn “subjective” cycle-related experiences into quantifiable and thus seemingly “objective” symptoms. In addition, the section also draws attention to the active role of app users in medicalising periods and

related symptoms and acknowledges the agency of menstrual apps as novel actors in patient-doctor interactions. The use of menstrual and other health apps in the context of patient-doctor interactions represents another aspect that is worthwhile to investigate in more detail. Further, I show that app-supported menstrual tracking contributes to the perception of regular, symptom-free periods as an indicator for good reproductive and/ or overall health. Although regular cycles and good health have been related since the beginnings of Western medicine, the findings highlight that the observation of periods via apps further adds to the strengthening of the perception of regular periods as “normal” periods, an understanding that stands in contrast to biomedical studies highlighting the frequent occurrence of cycle irregularities. The findings also demonstrate that tracking of reproductive health via period apps is not limited to heterosexual users, even though many apps contain heteronormative graphics and workflows.

Regarding the transformation of menses and bodies through app-supported menstrual tracking, the dissertation examines two principal aspects. First, I highlight changes in the understanding and experience of menstrual cycles and bodies through the shift from non-digital ways of menstrual observation to period tracking via apps. This part does not

only discuss the specificities of apps from a theoretical point of view but also presents users' opinions and experiences. In contrast to studies highlighting worrying aspects of digitized forms of self-tracking, my findings show that menstrual apps' characteristics such as their ubiquity, easy accessibility as well as the stability of menstrual records are appreciated by most users. The results also demonstrate that the variety of tracking categories offered by menstrual apps can help to increase users' knowledge on menstrual cycles. Nevertheless, I also reflect upon potential negative outcomes such as the overlooking of health issues by assigning symptoms exclusively to menstruation, and I present examples of users who reported on negative impacts, for instance increased stress provoked by discrepancies between their own memories and the apps' recordings. In the same section, the aspects of visibility and objectivity are discussed, highlighting their role in supporting the verification of symptoms experienced by the participants, as well as their potential contribution to the strengthening of gender norms. The second part explores the processes through which linkages between menstrual apps, digital data and users are being formed, highlighting sensory, emotional and cognitive interactions. The findings demonstrate that high correspondence between app-

provided data and users' experiences increase the perception of physical closeness between users' bodies and apps. I also report on the establishment of sensorial ties through the comparison of data visualizations with bodily and emotional sensations, as well as through haptic interactions of users' hands with mobile phones. Exploring the emotional linkages that arise from app-supported period tracking, the chapter describes the establishment of connections to other, unknown app users and underscores the active role of apps in this process. I also highlight that the emotions experienced during menstrual tracking potentially strengthen users' ties to their period apps. In fact, in some cases menstrual apps can take on the role of friends. Further, the chapter also briefly addresses the co-evolution of menstrual apps and users as both agents adapt in the course of tracking through changes in behaviour and algorithms.

The dissertation also gives insight into users' experiences and reactions to issues of privacy and surveillance, which represent crucial aspects in the context of the collection of intimate data. My findings show that most users give their consent to privacy policies without being fully informed, which is mostly a result of too laborious and complex legal texts and of users being confronted with a "take-it-or-leave-it" choice.

Further, I find that the different legal documents and options for consent users are confronted with lead to confusion rather than simplification. Moreover, the results demonstrate a high willingness to share menstrual and other health-related data for scientific research while the further use of digitally collected information for marketing reasons was perceived negatively but understood as unavoidable against the background of today's marketing economy. The section highlights the prevalence of "selling the self" discourses, emphasising an understanding of digital data as currency and privacy as the price one has to pay for digital services. Although there seemed to be a certain awareness of the unequal situation between app users and developers, the results highlight a tendency towards self-responsibilisation. The understanding that users are the first to protect themselves from privacy violations and surveillance is also reflected in the strategies and discourses, such as holding oneself accountable, and the relativization of associated risks. In general, the results convey the impression that the specific consequences of engagement in app-supported period tracking and other practices involving the recording of intimate data are very difficult to grasp for users. In fact, situations of immediate surveillance such as being monitored by working colleagues seemed to cause more

concern in several cases. Moreover, I also report on the affects of being surveilled, highlighting feelings of uncertainty and uncanniness.

Finally, the dissertation also examines gendered aspects of menstrual app design with a focus on users' opinions on and responses to potentially feminized graphics and workflows. The findings show that it is easier for the participants to identify gender stereotypes in period apps' graphic design than in their workflows and functions. The task to imagine a menstrual app for cis men facilitated the identification of inbuilt gendered norms and values for many interviewees. The results demonstrate that many users prefer gender-neutral and thus more inclusive designs. Further, it becomes apparent that the gendering of menstrual apps is not only limited to the use of stereotypical graphics and workflows, but also affects other aspects such as the quality of the information provided and the workload these apps require. On the other hand, the section also reports on practices of resistance questioning inbuilt gender norms and values. This includes practices of re-interpretation, appropriation and cessation.

The dissertation's findings provide hints for the future development of menstrual apps and health apps. The use of menstrual apps has an impact on users' understanding and perception of their menstrual cycles

and bodies. Hence, it is crucial that the workflows and information provided by health apps comply with the latest biomedical findings. Further, developers of health apps should be urged to inform users about the apps' strengths and limitations. Given the privacy concerns expressed by most of the study's participants, ethical handling of the collected data should be guaranteed. This also includes the provision of safe means to store and share the collected information. Moreover, apps' terms of use and privacy policies should be provided in a comprehensible manner. Regarding the design, health apps' graphic design as well as their workflows should guarantee usability for a wide range of users, including people of all genders, with varying sexuality and in different life situations. Apps might facilitate the interaction with healthcare professionals. However, health experts' support is crucial to successfully integrate health apps into healthcare procedures. In addition, health apps should clarify that digital observation of health cannot replace the consultation of healthcare professionals.

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9 ANNEX

9.1 Ethical Approval



9.2 Interview Guidelines

9.2.1 Menstrual App Users

Guideline semi-structured individual interviews

1. Use of ICT (information and communication technology)

Which mobile phone do you have?

Can you tell me how often you buy a new phone? What factors do influence this decision?

What do you use it for?

How many hours do you use it per day?

Which social media do you use/ access regularly?

Which apps are you using most frequently?

Which other technologies do you use regularly (laptop, desktop computer, tablet, apple watch, etc.)

2. Use of menstruation apps

- Can you describe me the menstruation app you use/ send me a screenshot?
- How long have you been using it?
- Why did you choose this one? How did you find out about it?
- Do friends/ partner/ family know that you are using this app?
- What features do you like best/ not? What could be better (design, information, accurateness, personalization/ customization etc.) - your vision of the ideal app?
- Can you describe me for what purpose(s) do you use the app (how often)? Which features do you use (period calender, contraception, sexuality, body tracking, monitoring, online

peer group support, emotional tracking, information, exercise, etc.) ?

- Does your app include in-app advertising and in-app purchases (e.g. update to pro-version)? Do you use this feature?
- Do you use any other (online) media in relation to your menstruation and health (websites, facebook, online discussion groups etc.)? Which ones?
- Would you also use it if it was available only in another language (e.g. English)?

3. Body Perception

- If you think of menstruation, which feelings or associations come to your mind?
- How would you describe your relationship to your menstruation?
- How important is your menstruation for how you feel with the rest of your body?
- Does how you feel about your menstruation influence the way you feel about yourself in general/ as a woman*?
- Are you suffering from pain related to menstruation? If yes, what do you do to relieve pain? Do you take medication?
- Do you feel your ovulation? How?
- Do you like the smell of your menstruation?
- How would you describe its texture?
- Have you ever tried it? Of others?
- Is there something you do differently when having your period?

- Would you say the app/ menstruation influences your sex life?
- How does your menstrual cycle influence how you feel?
- Do you think the app influences/ influenced the way you think about/ you perceive your menstruation and body (better informed, supported, more in control etc.)?
- What role does
- Do you think menstruation is still a taboo? If yes, why?

4. Interactions

- Do you go to the gynecologist?
- If yes: Do/ would you provide the data collected by the app to your gynecologist?
- If yes: How does this affect your visits/ communication with your doctor?
- In case the app offers a community network/ forum (or the user is using other platforms): Do you engage in online groups? In case that yes, for what purposes?
- Do you share your data on other online platforms?

5. Privacy and Security

- When downloading the app, were you asked to agree to terms and conditions (or something similar)? Did you read them?
- Is the security of your (medical) data important to you?
- If you learned that your (anonymized) data were sold to third parties (insurance companies, healthcare providers) – what would be your reaction?
- Who is to be hold responsible for the security of your data?
- Did you check where the medical information provided by

your app comes from?

6. Gender

- If the app was to be designed for men*, how would it look like?
- Would the app look different, include other functions?

9.2.2 *Healthcare Professionals*

GUÍA DE ENTREVISTA

Preguntas:

1. Menstruación y Enfermedades

¿Cuáles son las enfermedades/ patologías/ tratamientos médicos que influyen en la menstruación/ en el ciclo menstrual?

2. Capacidades y limitaciones de apps menstruales

- ¿Hay patologías donde la grabación continua de datos menstruales y síntomas asociadas tiene algún beneficio?
- ¿Cuáles podrían ser efectos negativos que resultan del uso de las apps?
- ¿Cómo se podría mejorar la app? ¿Cuáles son características (features) que faltan/ que tienen que ser adaptadas?
- Para mujeres heterosexuales: ¿Podría la app reemplazar la contracepción hormonal?

3. Interacciones

- ¿Podría servir la app para mejorar/ facilitar la interacción paciente – ginecóloga?
- ¿Podría servir la app para facilitar información médica?

- ¿Para apoyar la toma de medicación, de la píldora?

9.2.3 App Developers

Interview Guidelines App Developers

1. Profile and motivation

- Can you tell me about your company/ app/ project?
- How did you come up with this project/ app? Tell me about the story of the app/ project/ company.
- What are your aims, motivations, philosophy?
- Do you (aim to) make money with the app/ project?
- How long have you been working there?
- What is your position/ task?
- What did you do before? What do you want to do next?
- What else can you tell me?

2. Experience and use of mobile digital technologies

- Do you have a smartphone?
- What kind of apps are you using?
- Are you using health apps? Which ones?

3. Description of the app

- Tell me about the (menstrual) app.
- What features does it offer?
- Which operating systems are supported?
- Are there any differences as compared to other (menstrual) apps?
- Does your app include advertising? Is it available for free?

4. Interactions with users/ Development process

- Did you include user feedback in the development process?
- If yes, what did you learn/ adapt?
- Do you think that using your app will have an impact on users' lives? Which one?

5. Privacy

- What kind of approval does the app need in order to function?
- What happens to the data entered by users?
- Do you take any measures to protect users from privacy violations?

9.3 Sociodemographic Questionnaire



Universidad de Granada



GRACE – Gender and Cultures of Equality in Europe

Cultures of Equality 2.0:

On how mHealth apps engage in the performative production of gender and cultural equalities

SOCIODEMOGRAPHIC QUESTIONNAIRE

1. YEAR OF BIRTH _____
2. GENDER female male  other: _____
3. SEXUALITY heterosexual homosexual other: _____
4. ETHNICITY/ RACE: _____

5. FAMILY STATUS single married/ civil marriage single-parent
 relationship divorced widowed other: _____
6. CHILDREN yes no
7. PLACE OF RESIDENCE _____
8. COUNTRY OF RESIDENCE _____
9. COUNTRY OF ORIGIN (if different) _____
10. RESIDENCY STATUS EU citizenship resident visa refugee
 other: _____
11. RELIGION christian muslim jewish none other: _____
12. HIGHEST COMPLETED EDUCATION none secondary university
13. INCOME: _____
14. HEALTH/ ABILITY without with functional diversity chronic disease

Thank you!

9.4 Participant Information Sheet



Universidad de Granada



Gender and Cultures of Equality

Participant Information Sheet

Introduction

I am a PhD student and researcher at the Department of Social Anthropology at the University of Granada.

What is the purpose of the study?

The main purpose of the study is to investigate the use of mobile health applications (health apps) in order to find out more about users' motivations to engage with them, their experiences and opinions.

How will the study be conducted?

The research will be conducted in form of a face-to-face interview, which will take about one hour to complete. If you agree, the interview will be recorded with a voice recorder.

What are possible disadvantages or risks of taking part?

There are no known risks or disadvantages of taking part, as we strive to protect your confidentiality.

What are possible benefits of taking part?

In taking part, you will be able to reflect on your use of health apps, which can provide useful insights for technology use in general.

Do I have to take part in this research?

You are under no obligation to take part in this research. You can withdraw at any time without giving a reason and there will be no adverse consequences if you do so.

What happens with the information you provide?

Recordings of the interviews will be transcribed and analyzed. We will publish the results in academic papers and present them at academic conferences. If you wish to be informed about research results and provide your contact details, we will send the results to you.

Will the information I provide be kept confidential?

Yes. All of the information you give will be anonymized so that those reading reports from the research will not know who has contributed to it. Nobody other than the researchers will have access to the data, which will be saved securely on password-protected computers.

What if there is a problem?

Any complaint or concern about any aspect of the way you have been dealt with during the course of the study will be addressed.

Who is organizing and funding the research?

The study is part of a bigger project named GRACE (Gender and Cultures of Equality) funded by the European Union's Horizon 2020 research and innovation programme.

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Thank you for taking the time to read this Information Sheet.

9.5 Informed Consent



Universidad de Granada



Informed Consent Participants

I, _____, hereby agree to participate in this study to be undertaken by Johanna Levy, and I understand that the purpose of the research is to investigate the use of health-related mobile applications.

I understand that:

1. The aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me;
2. I voluntarily and freely give my consent to my participation in the research study;
3. I commit myself to telling the truth in order to ensure the realism of the data I provide;
4. Any information that I provide will not be made public in any form that could reveal my identity to an outside party i.e. that I will remain anonymous;
5. If I consider information to be sensitive I may decline to share it, or withdraw consent after having shared;
6. The data collected and the analysed results will be used for research purposes and may be reported in scientific and academic journals;
7. That I am free to withdraw my consent at any time during the study in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Participant Signature:

Date:

Contact Details:

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