

# Menstrual Cycle Tracking Apps: An Applied Combined Medical and Data Privacy Scoring

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**Abstract.** Today, many menstruating individuals track their cycles with mobile apps. These cycle apps use a lot of highly sensitive personal data. The goal of this study is to evaluate current cycle apps based on data privacy and medical criteria. First, a market analysis of currently available apps was conducted. Second, a scoring system was developed based on Digital Health application (Digitale Gesundheitsanwendungen, DiGA in German) guidelines, Mobile App Rating Scale (MARS), and other resources. A total of 18 apps were evaluated. The final scores (range from 0 to 1) ranged from 0.12 (worst result) to 0.64 (best result). The average “data privacy score” was 0.4, and the average “medical score” was 0.11. Only six apps received any points in the medical part of the scoring. A clear weakness of many tested apps was the issue of data minimization. 89% of the apps had permissions that were not necessary for this type of health app.

**Keywords.** Menstruation, Mobile Applications, Data Privacy, DiGA

## 1. Introduction

The World Health Organization defines women’s health as a fundamental human right. Every person that menstruates shall be granted “bodily autonomy” [1]. This includes having enough knowledge to draw informed decisions about your sexual health, behaviour as well as reproduction. In essence, every menstruating person should have some basic knowledge about their cycle, fertile window and menstruation [2–4]. Methods like fertility awareness (FAB or Natürliche Familienplanung, NFP in German) require close observation of bodily symptoms to determine the fertile or not fertile phases of the cycle [2, 3]. These methods demand daily tracking and documentation of symptoms like temperature or cervical mucus. Today, smartphone-based apps can guide and support menstruation persons tracking their cycle [2]. Some apps even determine fertile windows or predict the best time to conceive. Thereby cycle apps are tracking very sensitive data. By contrast, previous analysis concludes that many menstruation apps available today have – apart from questions about the evidence base – inadequate standards regarding data sharing, privacy, and security and that this is neither ethically or legally acceptable [5]. Other projects like “\*Privacy Not Included” of the Mozilla

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Foundation, whose goal is to present the current state of data privacy in mobile apps, show that most of these apps gather personal information and then publicly distribute it [6]. In light of the recent developments in the U.S. (“post-Roe”), concerned groups recommended deleting user profiles of cycle apps to protect their right to privacy and avoid consequences if data were breached or sold [7].

The aim of this study was two-fold (1) develop a medical and data privacy scoring using several references including the German DiGA guidelines, (2) apply the medical and data privacy scorings for German menstrual cycle tracking apps.

## 2. Methods

### 2.1. Development of a Scoring System

**Medical Accuracy:** The medical scoring comprises eight questions. It is largely based on the questionnaire by Freis et al. [5] with additions of questions of the information- and assessment platform “AppCheck” of the ZTG GmbH [8]. Freis et al. assessed the efficiency of various NFP methods. AppCheck includes aspects about medical quality and usability of mobile apps. The distribution of points was also based on Freis et al [9].

**Data Privacy:** Requirements for safety, functionality, data protection, information security, and quality defined in §§3 to 6 of the Digital Health Applications Ordinance (DiGAV) [10, 11] were the foundation of the data privacy scoring. In addition, items from Mobile App Rating Scale (MARS) and MARS-G (German Version) were used, disregarding any items concerning the aesthetic of the app. Lastly, questions of “AppCheck” were added.

### 2.2. Data Collection and App Scoring

A search for cycle apps was conducted on the two major distributors for smartphone apps: Apple App Store and Google Play Store. Search terms for the German-based stores were: “Menstruation” (menstruation), “Fruchtbarkeit” (fertility), “Zyklusapps” (cycle apps), and “Ovulation” (ovulation).

The following inclusion criteria for cycle apps were defined: (1) Description text of the app must contain information about cycle tracking or determination of the fertile window. (2) App must be available in English and German language. (3) The app can be used without any additional device (exception: medical thermometer). (4) The app is available in both app stores.

Every found app was scored by the first author between 04-01-2022 and 09-01-2022. After the scoring procedure, the first and last author validated the scoring of a random sample of apps together in January 2022.

## 3. Results

The medical scoring resulted with 8 questions and a maximum number of 24 points that can be reached for this dimension. The data privacy scoring comprised of 30 questions with one point per question, which resulted in a maximum point score of 30. A full score

in each of these scorings would be equivalent with 100%, i.e., 1.0. Both final questionnaires can be found in the supplementary materials<sup>2</sup>

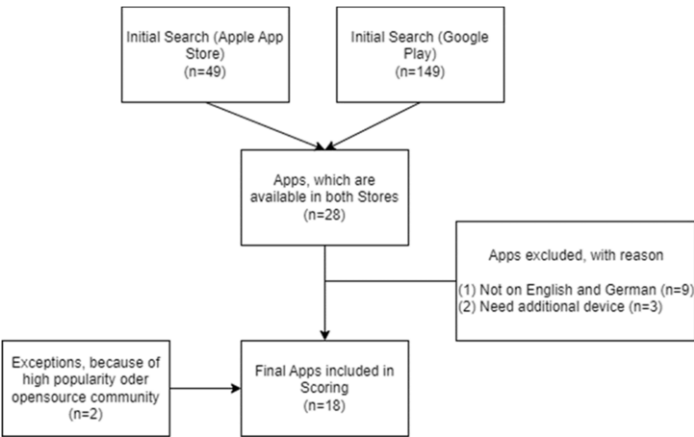


Figure 1: Selection process of evaluated cycle apps as PRISMA-Flowchart.

The process of app selection is visualized in Figure 1: During the initial search in the app stores 170 apps were found (for the full list of these apps refer to the supplementary materials). Among those 21 apps were only available in the Apple App Store; 121 only in Google Play Store. 28 apps were available in both stores. After the screening step 16 apps remained.

Additionally, two other apps were included in the evaluation: (1) myNFP, and (2) drip. The app “myNFP” is only available in German but it is very popular and the gold standard in the German NFP/fertility awareness community. The application is a class I-certified medical product [12]. The other app, “drip,” was (as of early 2022) only available in the Google Play Store (although its availability since was widened). It is an open-source cycle app developed (mostly) by women. The app claims to be especially data privacy-friendly and gained some popularity in Germany [13]. It uses the symptothermal method ruleset [14].

In total, 18 apps were included for closer inspection and evaluation. A list of these resulting apps, grouped by their FAB methods can be seen in Table 1.

3.1. Scoring

The combined scoring results (mean value of both relative results) range from 0.12 to 0.64 with a mean value of 0.26, see Table 2.

<sup>2</sup> Available under [https://github.com/ytehran/Femtech\\_Publication](https://github.com/ytehran/Femtech_Publication)

**Table 1.** All included 18 apps grouped by FAB method.

<b>FAB method</b>	<b>Name of the apps</b>
Calendar-based method	Flo, Clue, My Calendar, Menstruations-Kalender, Clover, Maya, Period Tracker, WomenLog, Menstruationskalender, Period Diary, Ladytimer, MMD, Menstruationszyklus & Kalender, MyFLO
Calculothermal apps	Ovy
Symptothermal apps	Femometer, drip., myNFP

**Table 2.** The medical, data privacy and combined scores of each app.

<b>Name of the app</b>	<b>Medical Score</b>	<b>Data Privacy Score</b>	<b>Combined Score</b>
Flo	0.52	0.7	0.3
Clue	0.57	0.24	0.41
My Calendar	0.45	0.0	0.23
Menstruations-Kalender	0.46	0.0	0.23
Clover	0.27	0.0	0.14
Femometer	0.58	0.38	0.48
Maya	0.39	0.0	0.2
Ovy	0.49	0.31	0.4
Period Tracker	0.26	0.0	0.13
WomenLog	0.23	0.0	0.12
Menstruationskalender	0.34	0.0	0.12
Period Diary	0.3	0.0	0.15
Ladytimer	0.4	0.0	0.2
MMD	0.23	0.0	0.12
Menstruationszyklus & Kalender	0.24	0.0	0.12
MyFLO	0.23	0.0	0.12
drip.	0.74	0.31	0.52
myNFP	0.55	0.9	0.72

The medical scores range from 0.0 to 0.9, with a mean value of 0.12. Regarding the medical dimension, “myNFP” achieved the highest score with 0.9 points. Two third of the cycle apps did not gain any points in this dimension. This was mostly caused by missing information about the algorithm that is used to determine the fertile window. Two apps (“Ovy” and “myNFP”) are certified medical products.

#### 4. Discussion

The app with the overall highest score was “myNFP”. This app was included as an exception in the scoring because it is currently known as the ‘gold standard’ for cycle apps in the German market (see [9]). Our results indicate this as well. There are individual aspects that can be improved in “myNFP”, such as adding 2FA or internationalization.

Overall, the majority of cycle tracking apps (n=14) use the calendar method, even though it is the least effective of all FAB methods. This can be attributed to the fact that the calendar method is the easiest to implement. One problem with this is that many of these apps do not explain the type of calendar method they use, so the user cannot understand how the fertile window is calculated. The algorithm for calculating the fertile window is the main part of a cycle tracking app and must be understandable, especially with the type of consequences involved. Without a public description of the algorithm, the app and its effectiveness cannot be analyzed, making it intransparent and unsafe.

The result that many cycle apps use their own or non-discernible algorithms to determine the fertile window, making their quality unassessable, was also observed by Duane et al. [15]. Another consensus in findings was on the topic of privacy policies. Fowler et al. also concluded that it would be the minimum for medically safe use of cycle apps to clearly warn the user of the medical risks within the app instead of hiding the risks in the terms of use. Fowler et al. also stated that privacy policies are usually too complex and are unlikely to be read [16].

From the 18 accessed apps only two (myNFP, Ovy) were certified medical device. By contrast, the Medical Device Regulation (MDR) defines devices for the control or support of conception as medical devices. With this definition in mind, every cycle app indicating fertile days could be considered a medical device. However, some apps state in their terms of use that it should not be used for birth control (despite screenshots in App stores that indicate otherwise). This is the very same phenomenon as fitness apps that offer heart rate monitoring but should be used for “fitness only” and no medical purposes.

At least one vendor offers a specialized app for increasing chances to conceive that is a certified medical device whereas the basic cycle tracker is not. One might argue where to draw the line here: Just tracking bodily symptoms without providing recommendations or visualizations for fertile windows is like using a paper-based calendar and should not be considered a medical device. Apps that claim to support in education about the menstrual cycle and learning about bodily symptoms thereby indicating fertile windows and then putting a disclaimer on display to not use the app for birth control may be sidestepping the MDR.

Despite achieving the second highest score, the performance of “drip.”, a three-year community-driven open-source application, can be considered commendable. Notably, its use of local data storage constitutes a unique approach in this domain. It is worth

mentioning that the app's development relies on the collective efforts of the community. The highest data privacy score of 0.74 was achieved by "drip.", either.

The overview of the individual results, as well as the final combined results are presented in the supplementary materials. The lowest result was achieved in the area of data minimization. In 71% of the cycle apps, the user was asked for voluntary and informed consent before processing their personal data. Two cycle apps limited the personal data to be processed to an appropriate minimum. The remaining apps had access to unnecessary data. They did not minimize access for the purpose of cycle tracking required data, e.g., locations, network information, contacts, or call information. It can only be speculated, but a cycle app without confirmed medical basis, with an incomplete privacy policy, many unnecessary permissions, and the use of marketing trackers, appears to be a means of collecting information for data trading.

No app offered 2-factor authentication whereas 78% offered functionality to protect the app with a password or code. Most apps (83%) do not offer an explanatory tutorial for users. Risks that may occur when using the app are mostly mentioned in the general terms of service.

The area of consent had the best results. This is not surprising since obtaining consent is easy to implement and mandatory under the GDPR Article 25(2), referred to as "Privacy by Default". The lack of consent and active approvals in the apps that performed poorly in this regard is surprising and can be attributed either to unethical motives or a lack of interest in data protection.

#### *4.1. Limitations*

Many of the requirements for a DiGA are internal to the company and therefore cannot be assessed by an external person. It is also important to consider that the companies of the evaluated cycle apps may not have the goal of classifying their app as a DiGA. The medical aspects of cycle apps were evaluated based on basic items. The effectiveness of cycle apps was not analyzed in this evaluation. In such an analysis, the apps would also have to be assessed according to their intended use (desired pregnancy or contraceptive method). This was not considered in this evaluation.

In searching for cycle apps, only the two most widely used app stores were used. In addition, cycle apps were only evaluated if they were available in both German and English. These restrictions reduced the number of apps examined. It should be noted that new apps are continuously being developed and existing apps are being further developed. This work is therefore only a snapshot.

In addition, some items of the scoring, especially in the area of user-friendliness, had to be subjectively assessed. Ideally, instead of the assessment of a technically proficient person, a systematic approach should be used to answer this item objectively.

## **5. Conclusion**

The aim of this study was not to recommend specific apps for use, but to provide scientifically based information about the medical background and data privacy of the apps. Each user must decide for themselves which type of cycle app they want to use. However, it is recommended not to use cycle apps that rely on the calendar method.

Although these apps are the most common, they are also the least medically correct. The scored apps lack especially in the area of data minimization.

## Declarations

*Conflict of interest:* None.

*Contributions of the authors:* MP and VS designed the study. YNT performed the data collection and scoring. YNT wrote the first draft of the manuscript. MP and VS revised the manuscript.

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