Developing a Perimenopausal Symptom Tracker to Aid in Symptom Awareness and Identification of Perimenopause

by

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Bachelor of Science
in
CS408: Individual Project

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Abstract

The abstract is a bird's eye view of the project.

It should not exceed one page. Mention the scope and objectives of the project, the methodology used,the main findings, and significance of your results.

Acknowledgements

I would like to thank the participants who evaluated my project, my supervisor etc.

Contents

1 Introduction

This is a concise and clear overview of your dissertation(more or less 2-3 pages). You can start off the project description provided of the project that was allocated to you and flesh it out.

Include (1) the problem you have tackled, (2) why this problem is worth addressing, (3) what you did to address it - in broad terms. Detail will come later.

i.e., issue(s) on which the research will focus, shall be clearly identified and described. You shall refer to past research work relevant to the topic and objectives, i.e, of the study. You shall outline where applicable the potential research output with respect to research transfer and uptake by the community.

The introduction says: this is an overview of the project. This is why I did it (the problem) and how I tackled it. It is the *runway* into the project. It lets the marker know what to expect of your report.

If you're doing a research project, this would be the place to include the research questions you plan to address. For example:

RQ1: Where did James Bond come from?

RQ2: Why are pumpkins orange?

If you're doing a project of type 1, include a list of objectives. For example:

Objective 1: Provide software to allow James Bond to become invisible.

Objective 2: Provide software to keep track of all loyalty points in one place.

Provide a 'map' of your dissertation. For example: Section **??** reviews the background literature that was reviewed to inform this project. Then Section **??**.....

2 Background Literature

2.1 Perimenopause

The American Journal of Epidemiology[**?**] states that perimenopause is the transition period of a womans life, which starts with a natural shift in ovulation and menstruation patterns and/or increased symptoms, and ends when a woman enters menopause. It classifies menopause as when a woman has not had her period for a year. This Lancashire and South Cumbria NHS Foundation Trust's article on Perimenopause, Menopause, and Pain[**?**] states that during perimenopause, the body's production of estrogen, testosterone, and progesterone fluctuates significantly and can stay low forever if no treatment is taken. This change in hormones drastically changes the way a woman's body and mind work. A Swiss Perimenopause study[**?**] found that women experiencing lower estrogen and progesterone levels had higher suicide intent scores and were more likely to develop depression, which is backed up by another study from the Journal of Psychiatric Research which found a correlation between low progesterone states and suicide[**?**]. Other effects of perimenopause are much more common, and perimenopause may not be the obvious source. During Perimenopause, 80% of women experience hot flashes[**?**], 77% joint pain[**?**], 60% memory issues[**?**], over 20% experience heart palpitations[**?**], 1/4 women have really heavy periods[**?**], 50% of women say it negatively impacts their sex lives[**?**], and 1/10 women leave their jobs because of menopausal symptoms[**?**]. It therefore comes as no surprise that almost 90% of women seek out their healthcare provider for advice on how to cope[**?**]. However, in the US, 3/4 of women who ask for medical help are left untreated, causing women to turn to other sources of help and information[**?**].

2.2 Menopause Education

A University College London publication on women's post reproductive health[**?**] explores the extent of knowledge women have about menopause. When it comes to menopause, most women are left untreated and unsupported. Without sufficient education, most are left suffering due to hormonal imbalance and lifestyle changes they are unprepared for and do not have the information they need to help them cope. In this study of 829 postmenopausal women, 90% were never educated about the menopause. It is rarely included in sexual

education received in school, and though awareness is increasing, it is still rarely talked about in the media and considered a taboo and private subject only to be talked about with your doctor[**?**]. Talking to the doctor is also problematic as doctors are also not well educated on menopause[**?**]. The NHS site on the treatment of menopause[**?**] states that many menopause symptoms can be effectively treated with hormone replacement therapy (HRT), even symptoms such as hot flushes can improve within a few weeks. However, a study of 3000 british menopausal women who complained to their doctors of low mood or anxiety symptoms found that 66% were offered anti-depresseants instead of hormones[**?**]. In fact, 1/4 of women are on anti-depresseants post menopause[**?**] despite the fact that antidepressants don't help low mood in menopausal women with hormone imbalances, and according to the National Institute for Health and Care Excellence[**?**] HRT should be offered first. This may be largely due to lack of education doctors receive about menopause. 41% of UK medical schools do not give any mandatory menopause education[**?**]. Professor Joyce Harper, an internationally renowned, award-winning scientist and a professor of reproductive science at UCL, states that "The data shows that women have a lack of education about this key life stage. Together with a reported lack of education from their healthcare professionals, women may be left undiagnosed and unsupported"[**?**].

2.3 Symptom Tracking Apps and Technology

When women do not receive education from school, their communities, or their doctors about peri-menopause, they will look for tools and education from other sources such as websites or apps to research, track, and analyse their experience. Over 50 million women worldwide use apps to track their menstrual cycle and examine a variety of other cycle-related factors[**?**]. There are 300 menstrual tracking applications available for download and an estimated 200 million downloads worldwide[**?**]. Symptom monitoring and appraisal methods are effective for reducing menopausal symptoms, and improving health awareness, shared decision-making, patient-doctor communication, and treatment goal setting[**?**].

While these apps can be effective tools for dealing with symptoms, one of the most prominent issues with these apps is the lack of privacy. The apps often earn profits by selling users' data to third parties, even if there is a promise of privacy advertised by the companies[**?**]. An article by the Director of Research for Sexual and Reproductive Health and

Rights, Population Institute in Washington, DC titled, "Missed period? The significance of period-tracking applications in a post-Roe America" highlights the increased concerns around this surveillance capitalism since the June 2022 overturning of Roe vs Wade in the US stated that the right to abortion is not constitutionally protected[**?**]. It further explores how users personal tracking data may be used against them in court as evidence of having an abortion regardless of miscarriages, irregularities in menstrual cycles, and/or imperfect engagement with a period-tracking app. Some apps have even gone on record to say they will hand over users data to law enforcement if asked. The article even explains how some experts advise people who menstruate to track their periods on paper as opposed to using an app for their own protection. These 'FemTech' mobile apps currently fall outside of the scope of the Health Insurance Portability and Accountability Act, which protects sensitive health information from being disclosed by covered entities without the patient's consent or knowledge[**?**]. This highlights the ever increasing need for privacy in menstrual tracking apps.

A study[**?**] exploring the design experience of digital period trackers found that to best design digital period trackers for users, Hertzum's images of universal, situational and cultural usability should be used. This correlates with Dawsons concepts of evidence-based, usable, readable, interactive, and culturally sensitive design choices for health apps [**?**]. It found that a good period tracking app should know the users life stage, medical "situation", contraception, purpose of tracking, and tracking interests. It also highlights the need for education resources within these health apps and the importance of users having access to relevant, reliable health information such as including external links to information.

Not only do these peri-menopause apps have to be free, private, and personalised, but they must be accessible to all who want to use them. The European Accessibility Act (EAA) becomes law on the 28th of June 2025. The EAA is a landmark legal change that will improve the lives of disabled people by ensuring equal access to digital products and services for European Union (EU) consumers[**?**]. The EAA requires products and services to be Perceivable, Operable, Understandable, and Robust (known as POUR).

There are many app rating frameworks available including the Mobile Application Rating Scale (Mars), A-MARS, THESIS, App Quality Assessment tool for Health-Related Apps

(AQUA), the Digital Health Scorecard, the American Psychiatric Society App Evaluation Model, Beacon, Psyberguide, Happtique Health App Certification, Intercontinental Medical Statistics (IMS) Score, the EU Kitemark, and the FDA's procedures for approval of digital tools as medical devices[**?**]. MARS' is designed to classifying and assessing the quality of mobile health apps[**?**]. In a studying reviewing many different mobile health app rating scales, MARS is one of the most popular scales and is one of the only scales designed to be used by the public or those with little to no experience reviewing health apps[**?**]. Since MARS is widely known, easy to use, and assesses apps based on engagement, functionality, aesthetics, and quality of information, MARS was ultimately the better fit for this project.

In order to decide what apps to rate, the top 10 results in the apple app store for the search terms "Perimenopause Tracker", "Perimenopause", and "Menopause" were listed. These terms were then ranked by frequency of appearance across these search terms and a final ten apps were chosen to be rated. From the ratings, it is concluded that Clue and Flo had the best app design as their app was clear, intuitive, and fast. Balance and Health and Her were more tailored to menopause and had significantly more perimenopause features including classification quizzes to determine what stage you are in, pop ups and notifications when changes in patterns are detected, and resources to learn more about perimenopause and menopause.

When comparing Scrum to Kanban methods, Kanban is found to often be better in terms of managing project schedule[**?**]. It also has the following benefits: increased visibility, improved work flow, and faster time to market[**?**]. Kanban boards and cards are easier to manage for a solo project compared to organising sprints, backlogs, and checkpoints for a Scrum system. Scrum also works better in teams of 3-9, not solo projects[**?**]. Kanban has even been shown to help student manage their workload and get assignments in on time[**?**].

So given these issues, this project attempts to address them by developing an app which allows women to track, analyse, and learn about peri-menopause while ensuring a focus on users privacy and anonymity.

3 Specification & Design

Before beginning the process of gathering user requirements, an ethics form must be completed to ensure that the research follows ethical guidelines. To better understand user needs, a User Requirements survey was designed. In preparation, research was conducted through books on women's experiences during perimenopause, including works by Kat Muir and Davina McCall, as well as reviewing research papers on health-tracking applications and a review of existing apps on the market to assess current solutions. Privacy emerged as a significant concern, with many apps engaging in surveillance capitalism and selling user data, often without informing the user. Only a handful of apps claim not to sell data, but even some app who claim not to sell data have been found guilty of making a profit off users data. To ensure a user-centered approach, User Stories were developed to capture potential users' needs and expectations. As the project developed, user requirements and stories were continually adjusted to best reflect the goal of this project. The Design Testing Stage incorporates the System Usability Scale (SUS) evaluations and A/B Testing through microsoft forms. User interviews are also conducted to refine the design based on feedback. Recruitment for testing was also planned, stating the target audience for this study was women between the ages of 30 and 65.

3.1 Methodology

Following research on the different available software lifecycle approach softwares and methods available, Kanban boards were chosen as they are easy to maintain for one person, help with workflow, and have been proven to work in a student setting as mentioned prior. GitLab Issue boards were selected as the platform to host the Kanban as each issue card can be linked to branches within repositories to keep track of which tasks and changes are for which branches to improve organisation. Labels were also added to signify the type of task for each issue card.

3.2 Analysis

Given many peri-menopausal women are not receiving support from the government education system or their doctors, additional resouces and tools must be provided to help

them navigate this stage of life. With the rise of technology, several tools are now available to allow women to track their peri-menopausal symptoms. However, these tools are often not user-friendly, do not provide enough educational information, or are not privacy-focused. The issue around privacy is especcially concerning as many apps are selling user data to third parties without user knoledge consent, and in todays political climate this can result in the incarceration of the user in some parts of the US. Since there are no apps that provide a comprehensive solution to these problems, the goal of this project is to create a user-friendly, educational, and privacy-focused peri-menopausal symptom tracking app.

3.3 Requirements

3.3.1 Functional Requirements

This Apps functional requirements were prioritized based on user needs and the project goal. Essential functional requirements impacting usability such as being able to navigate to a screen were prioritised over design and content details. The following functional requirements were identified:

- Users must be able to log their period start and end dates to track cycle and period length.
- Users must be able to log their peri-menopausal symptoms and their severity daily to track changes over time.
- Users must be able to edit or delete logged symptoms and period data at any time.
- The app must store all user data locally using AsyncStorage on the users device, ensuring no data is stored on external servers.
- The app must include a calendar view where users can see logged symptoms and period data over time.
- The app must provide an option to reset user data to align with privacy-focused design principles
- The app must provice graph-based visualizations showing symptom frequency and period heaviness trends over time.

- The app must calculate and display the most common symptom based on user entries.
- The app must provide cycle length insights based on logged period data.
- The app must calculate average period length based on tracked cycles.
- Users must be able to access an Analysis Tab summarizing trends.
- The app must feature a Learn Page with information on perimenopause and related topics.
- Users must be able to access external links to trusted resources for more detailed information.
- The app must follow EU accessibility standards, including text scaling, color contrast, and screen reader compatibility.
- The app must support multiple languages to accommodate diverse users.
- Users must be able to enable or disable notifications/reminders for period tracking or symptom logging.
- The app must work fully offline, allowing users to track symptoms and view their data without an internet connection.
- The app must not crash or freeze during normal usage.

3.3.2 Non-Functional Requirements

- The app should be easy to use and navigate, with a clean and simple design.
- The app home page should load within 3 seconds.
- All data visualization such as graphs, calendar, and analysis charts should render in under 2 seconds.
- The app should allow easy localization to support multiple languages.
- The UI should offer a dark mode and high-contrast mode to improve readability for all users.
- All text elements must support dynamic font resizing based on user preferences.

Anonymous User			
	Date1		
		Symptom1	Severity
		Symptom2	Severity
	Date2		
		Symptom1	Severity
		Symptom2	Severity
	Date n		
		Symptom1	Severity
		Symptom2	Severity

- The app should look the same for various screen sizes, including tablets and smaller phones.
- The app must be designed with easy language switching to support multiple languages in the future.
- The app should maintain consistent navigation and UI patterns across all features to reduce confusion.

3.4 Design

3.4.1 Interface Design

At the beginning of the design process, 6 pages were drawn by hand to rough sketch the layout of the app. Once the rough sketches were completed, they were digitized using Figma. The design was created with a focus on simplicity and ease of use. The app was designed to be user-friendly and intuitive, with a clean and simple design. The color scheme was chosen to be calming and easy on the eyes, with a focus on blues and greens. The app was then compared to the EU WAG 2.1 accessibility standards and adjusted to be accessible to all users, with large text and color contrast.

3.4.2 System Design

In the interest of protecting user privacy, there is no database and all data is stored on the users local device. The data that is saved in AsyncStorage on their device is formatted as featured in the table below.

4 Product

4.1 Implementation

Provide implementation details: language used, architecture (e.g. server and client, or hub and spoke). Explain how you secured personal details.

During the design and inital development phase, a prototype was made using React and js with and npm node.js server. The change to another solution was much needed as using React with localstorage or a database comes with many privacy and security concerns that do no align with the functional requirements. The next Implementation was using Go and React with typescript for more security but due to typescript being a more strict language development was ssignificantly slowed down along with the complexities of safely sending data back and forth between Go and React tsx. A GoLang Envoy Proxy was considered but due to the exponentially increasing complexity another solution was needed. That is when the final implementation was decided to be a React native app that uses both typescript and javascript. This allowed for a lot of work to be moved over without rewriting files, as well as having the ability to use typescripts strict type checking for mroe conmplex files to make debugging easier and faster through type saffety aand reduces runtime errors. Expo was also used for the react native app due to its easy routing capabilities, intuitive and easy testing setups, and debuggers.

4.2 Verification & Validation

Using Expo, the app was trialed and tested on mobile devices and emulators to ensure that the app was functioning as expected. The app was tested on iOS devices with different screen sizes to ensure that it was responsive and that the UI was consistent across all devices. The app was also tested for performance, and adjustments were made to ensure that it was fast and responsive by using a timer to measure the time it takes for the app and its different pages to load on click. Jest (A JavaScript Testing Framework that works with React Native) was also used to make unit tests to validate whether components render and if they render correctly.

5 Results & Evaluation

Results are often presented in tables, figures and other relevant illustrations. Include text that refers to these figures/tables.

5.1 Evaluation Process

If you involved humans in the evaluation, how many did you have? What can you say about the demographics of your participants? (If you did collect these)

In terms of the *user interface*, how did you carry out a usability evaluation, how did you go about doing this? How did you recruit participants?

In terms of delivering *functionality*, did you carry out user acceptance testing? (see attached guidance).

5.2 Results of Evaluation

This Section includes a direct interpretation of the gathered data and evaluation processes.

5.3 Returning to the Research Questions

Return to research questions or objectives as appropriate.

5.3.1 RQ1

It is clear from our findings that James Bond was born in Wigtown in Scotland. However, he grew up in Diss, in Norfolk. We know this because ....

5.3.2 RQ2

We were not able to answer this question from our studies, although some suggestions were made. These could not be proven.

5.3.3 Objective 1

5.3.4 Objective 2

6 Discussion & Reflection

6.1 Interpreting the Results

Here you will discuss your findings. This is especially relevant for research projects. You might interpret what the data and evaluation implies, both for future research and for practice (if appropriate).

The discussion is **not** a review of literature. You should try to compare research findings with previous work, provide explanations for your findings, discuss research findings, in terms of their contribution.

6.2 Reflection

Look back and think about what you would do differently if you were going to start the project with the knowledge you have now. Be honest about your mistakes or missteps.

6.3 Challenges

This is not the place to mention personal circumstances but rather challenges related to the work involved in the project.

6.4 Limitations

Acknowledge things like: small number of participants, software wasn't completely debugged, or whatever else went wrong and affected your project. *Include as appropriate*

6.5 Future Work

If someone else wanted to build on your project's product, what would be cool to do next?

7 Conclusion

The conclusion is similar to when a plane lands. You don't rewrite the introduction. You say something like - I addressed the problem outlined in the introduction, and I built some software to do this. I tested the software like this ADD FEW WORDS.

Summarize main findings drawn from the project work. Mention the objectives or research questions. Do not repeat points raised in the discussion and reflection Section. If applicable, you can make recommendations. The conclusion should NOT contain any references.

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A Appendix

This is where you can include your documentation.

Remember that the marker is not required to read this, but might well check to ensure that you have included product documentation, and ethical approval, as required.

A.1 Ethical Approval Form

If your project required you to do any evaluation with humans, you MUST include this. It can be downloaded from the Ethics system.

`https://local.cis.strath.ac.uk/wp/extras/ethics/index.php`

A.2 Participant Information Sheet

If your project required you to do any evaluation with humans, you MUST include this

`https://www.strath.ac.uk/ethics/informationsheetandconsentform/`

A.3 Consent Form

If your project required you to do any evaluation with humans, you MUST include this.

`https://www.strath.ac.uk/ethics/informationsheetandconsentform/`

A.4 Marking Scheme

REMEMBER TO DELETE THIS. IT IS ONLY INCLUDED FOR your INFORMATION.

11.2. Marking Schemes

There are three marking schemes which weight the assessment criteria as follows.

	Software Development Based	**Experimentation-based with Significant Software Development**	**Experiment-based**
Project progress presentation	10%	10%	10%
Product			
Implementation (including documentation as this indicates maintainability)	25	20	10
Verification and Validation	10	5	5
Product Total:	35%	25%	15%
Process			
Methodology, analysis and documentation	15	20	20
Design	10	5	5
Process Total	25%	25%	25%
Results and Evaluation			
	15%	25%	35%
Report Presentation			
	10%	10%	10%
Student Performance			
	5%	5%	5%

Table 1: App Search Terms and Results in order of appearance on the Apple App Store.

Terms	Perimenopause Tracker	Perimenopause	Menopause
	Natural Cycles: Birth Control	Clue Period & Cycle Tracker	Flo Period & Pregnancy Tracker
	Clue Period & Cycle Tracker	Perry - perimenopause Community	John Hopkins Menopause Guide
	Health & Her Menopause App	Health & Her Menopause App	Health & Her Menopause App
	MenoLife - Menopause Tracker	Caria: Menopause & Midlife	MenoLife - Menopause Tracker
	Balance - Menopause Support	MenoLife - Menopause Tracker	Caria: Menopause & Midlife
	Perry - perimenopause Community	Clue Period & Cycle Tracker	Menopause Stage - Clearblue me
	Caria: Menopause & Midlife	Balance - Menopause Support	Balance - Menopause Support
	Flo Period & Pregnancy Tracker	Flo Period & Pregnancy Tracker	Joylux Menopausal Health App
	Period Tracker by GP Apps	Joylux Menopausal Health App	Clue Period & Cycle Tracker
	Moody Month: Cycle Tracker	Stardust: Period & Pregnancy Tracker	ACOG

Table 2: MARS Quality Scores for Perimenopause Apps

App Name	Engagement	Functionality	Aesthetics	Information	App Quality	Subjective
Clue	3.6	4.5	4.3	3.6	4	3.75
Balance	4	3.5	3.66	3.5	3.66	3.75
Caria	2.8	3.5	4.33	3	3.4	1.5
Health and Her	3.8	4.25	3.66	3.16	3.71	3
Perry	2.6	2.5	2	2.1	2.3	1
Natural Cycles	2.6	4	3	3.1	3.17	1.25
Flo	3.8	4.25	5	3.5	4.13	2.5
JoyLux	2.6	5	3.6	4.1	3.8	1.75
MenoLife	0	0	0	0	0	0
John Hopkins Menopause Guide	1.6	5	2.6	5	3.55	2.5