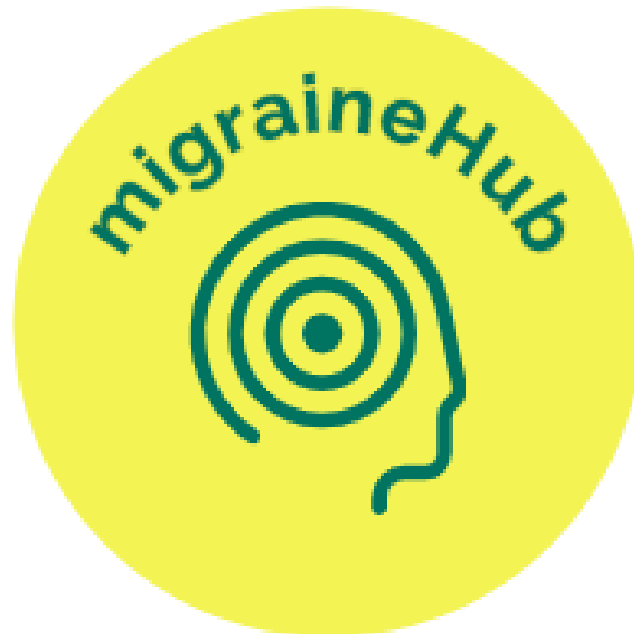




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Project Report

Student Name: Michelle Bolger

Student Number: C00242743

Supervisor: Dr. Chris Staff

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Abstract

The inspiration behind this project was to discover more information about migraines, their triggers and symptoms and also to discover information about tracking migraines and the benefits of keeping a journal of migraines.

The purpose of the “migraineHub” app is to develop a cross platform mobile application that will allow people who suffer from migraines to record their migraines (the frequency, type of migraine, pain scale, medications, triggers and symptoms).

Users will also be able to view statistic about their past migraines and email this information to themselves for future reference or for review by their doctor/neurologist.

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1. Introduction

The purpose of this report is to provide a detailed overview of the completed project.

This document will include description of the completed project as well as a technical description of what the project entails.

The final UI/UX will be shown as discussed through the use of screenshots of the working application. The structure of the database will also be presented. The UI/UX testing which was carried out will also be discussed.

The issues that were encountered during the development process will also be fully discussed in detail along with how these issues were overcome.

Both technical and personal learning outcomes will also be provided. Finally a review of the completed project will be provided as well as discussion on what could have been done differently within the project if it was started over.

2. Project Description

The main goal of migraineHub application was to provide individuals who suffer from migraines a way to track their migraines. The initial plan was to allow users to track a number of aspects about their migraines and to allow them to view statistic about their past migraines and email this information to themselves for future reference.

The application that has been delivered has adhered to the original plan. Users of the “migraineHub” app are able to record their migraines (type of migraine, pain intensity, medications, triggers and symptoms). Users can also track any food they have eaten with the use of a barcode scanner. This scanner has also been implemented into an allergen checker to let users know if any food they have eaten in the past will affect their migraines.

Users are also able to view statistic about their past migraines and email this information to themselves for future reference.

3. Technical Description

3.1 Xamarin Forms

The migraineHub application was developed using Xamarin.Forms. This framework was chosen for its capabilities to build application from a shared codebase with the UI code written in (XAML) and the back-end code written in C#.

3.2 Firebase

Google's Firebase Realtime Database has been used as the database for this project. Firebase is a cloud based non Structured Query Language (NoSQL) database which allows users data to be stored and synced in realtime.

This database was chosen as it is optimised for offline use ensuring that if a user loses connection then their information will be stored locally on their device and when a connection is re-established their data will automatically be synchronised.

3.3 API

The OpenFoodFacts API is used to provide information about food items that are scanned by users.

The OpenWeather API is used to provide up to date weather information about a location a member has entered. This API provides current weather data collected from a number of different sources such as global and local weather stations.

The Xamarin.Essentials API is used to allow members to send e-mails with their migraine information. This API opens a default email application and will include a specified subject, body and recipients.

3.4 NuGet Packages

A number of NuGet packages were used for this project. These packages were installed to ensure the app functioned correctly.

The following are details about the NuGet packages used:

FirestoreDatabase.net	A C# library for Firebase Realtime Database built on top of Firebase REST API. Supports following: <ul style="list-style-type: none"> • Offline storage • Querying using available filters • Passing in authentication token • Streaming online changes • Directly Posting / Putting / Patching online data
FirestoreStorage.net	Easily upload files and other content to Firebase Storage.
MagicGradients	Draw backgrounds in a Xamarin.Forms application. Powered by SkiaSharp.
Microcharts.Forms	A simple, cross-platform chart library.
Newtonsoft.Json	A popular high-performance JSON framework for .NET
Xamarin.Essentials	A kit of essential API's for your apps
Xamarin.Forms	Allows native UIs for iOS, Android to be built from a single, shared C# codebase.
ZXing.Net.Mobile.Forms	A C#/.NET library based on the open source Barcode Library: ZXing (Zebra Crossing). The goal of ZXing.Net.Mobile is to make scanning barcodes as effortless and painless as possible in your own applications.

3.5 GitHub

GitHub was used throughout the duration of the development process. Regular commits were made to a GitHub repository.

4. Final Screens

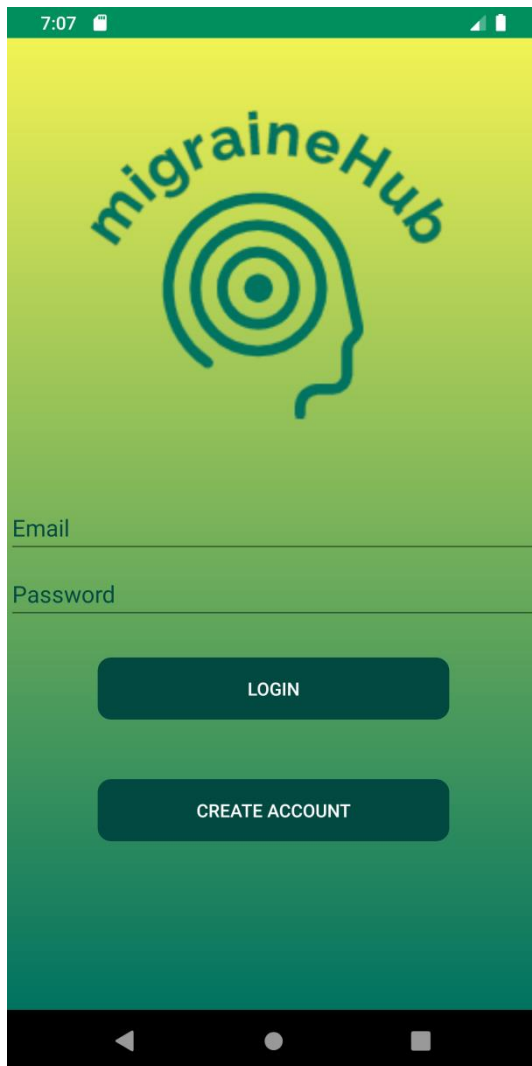


Figure 1 - Login Screen

The login screen as shown in *figure 1* is the first screen that is shown to a user when the application is opened.

A user can enter their email and password and will either be successfully signed in if they have previously created an account or will be shown an error message if they have no account.

Users can also choose the option “create account” to navigate to the create account screen.

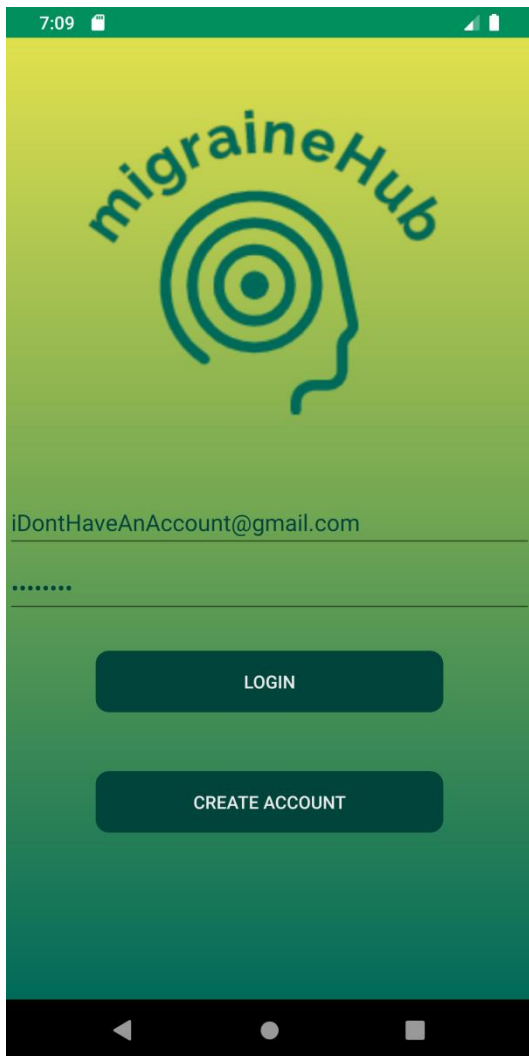


Figure 3 - Entering Invalid Details

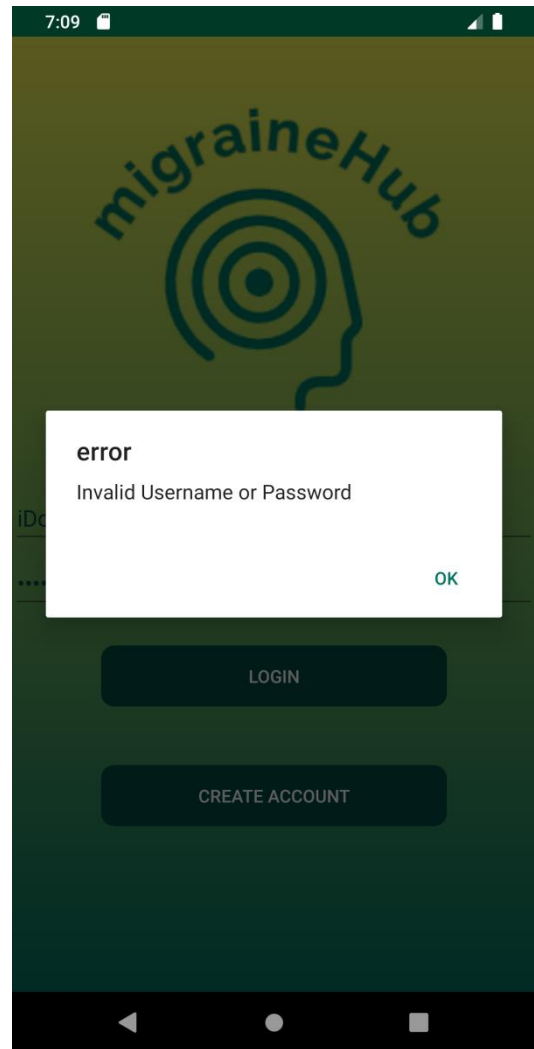


Figure 2 - Error Message

As shown in *figure 2* an error message will display informing a user they have entered an incorrect email or password when they attempt to login with invalid details as shown in *figure 3*.

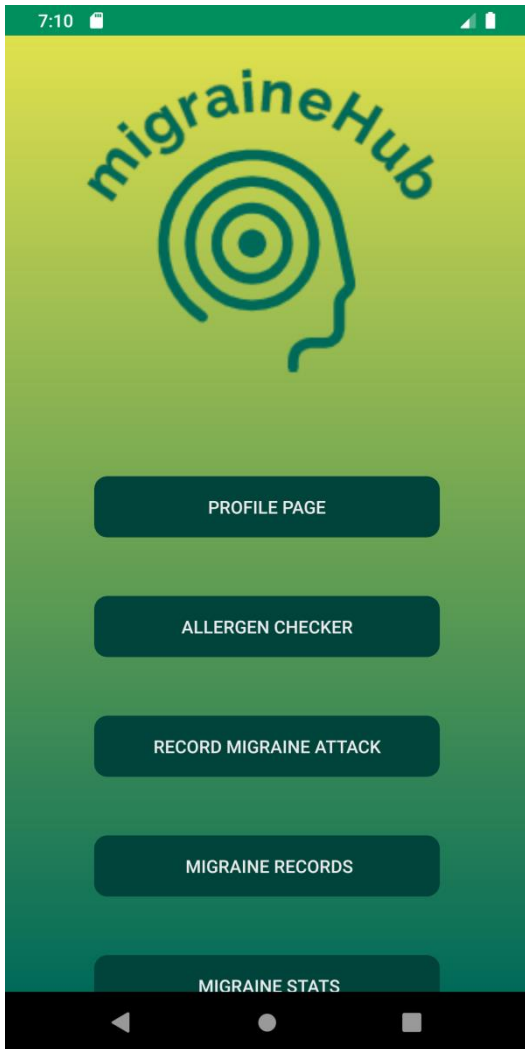


Figure 5 - Main Menu

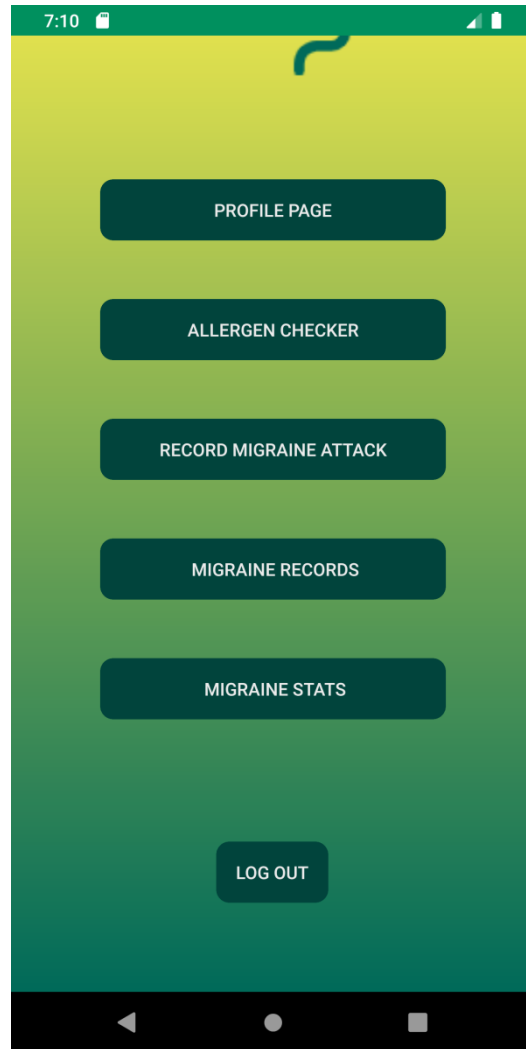


Figure 4 - Main Menu

The main menu is shown in *figures 4 & 5*. Users will be navigated to this screen upon successful login or when a new account has been created.

This screen displays all the options within the application that a member can navigate to. There is also a log out button for when a member wishes to log out of the application.

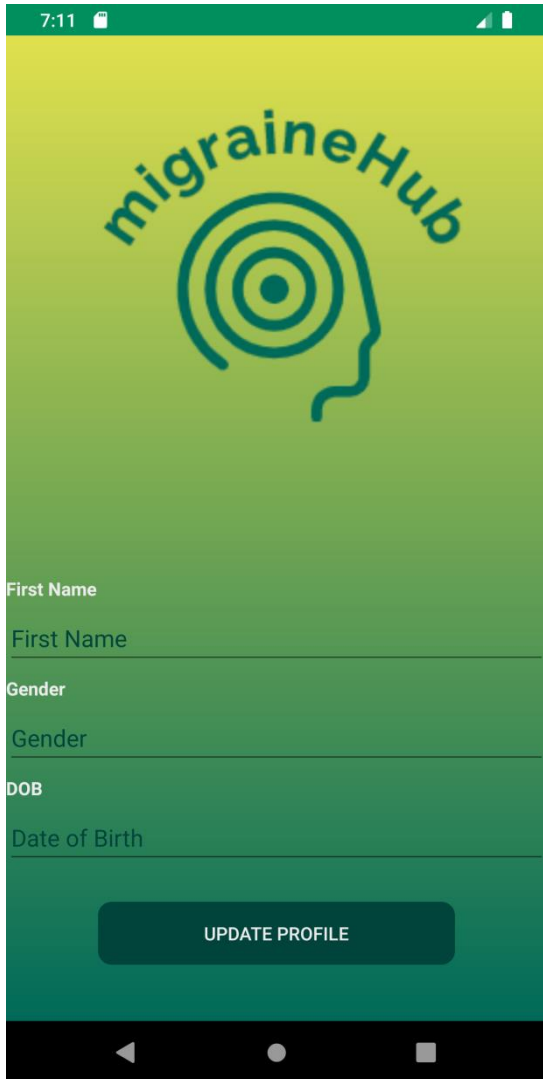


Figure 7 - Profile Page

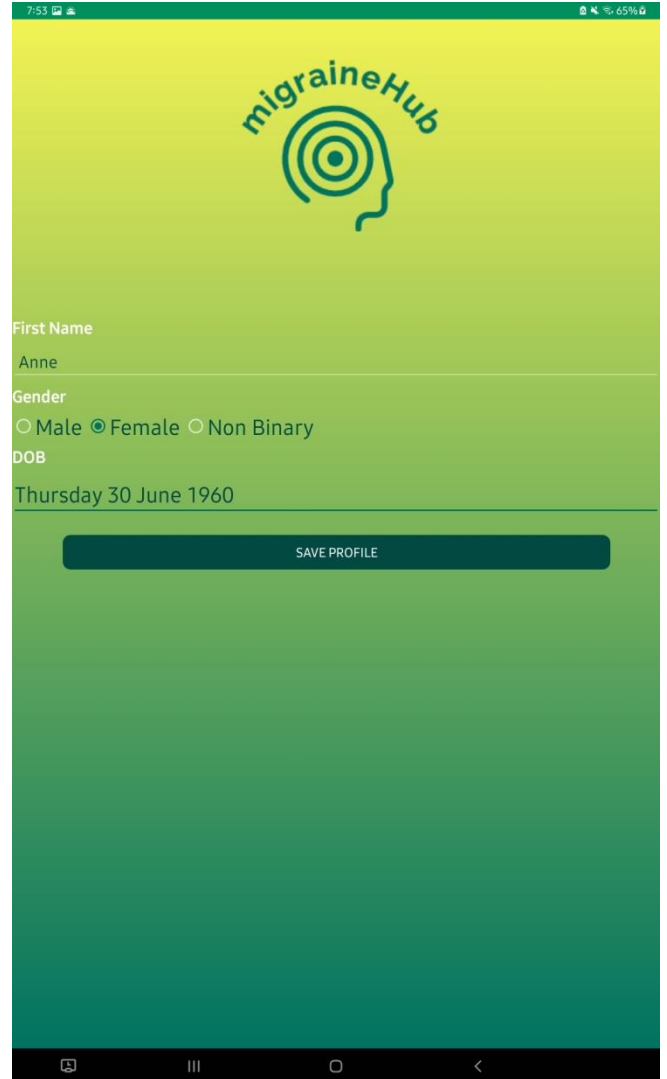


Figure 6 - Update Profile

Figure 7 shows the screen that is displayed when a member selects the profile page option on the home screen. Here the users name, gender and date of birth are displayed. When a member wishes to update their profile they can select the update profile option and they will be navigated to the update screen as shown in figure 6. On this screen members can enter or update their details and save their profile.



Figure 8 - Record Migraine

Figure 8 shows the record migraine screen, this screen is displayed when a member has selected the record migraine option.

On this screen a member can enter the details of their migraine.

To enter details a member selects an option such as pain location and enters the appropriate details and saves their input, they will then be sent back to this screen to complete the record. Once the member has entered all the desired details they can select the save button. This will save the record into the database.

If a member wishes they can also simply press the save button without entering any details, this will save a blank record which can be edited later.

A member can also select the back option, this will bring them back to the main menu screen.

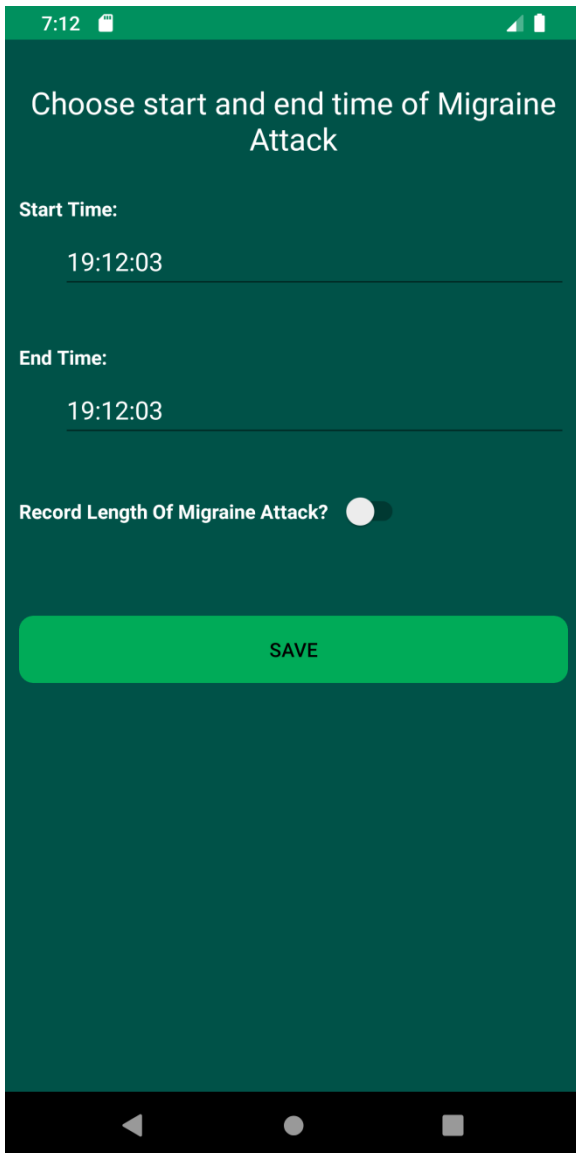


Figure 10 - Choosing Start & End Time

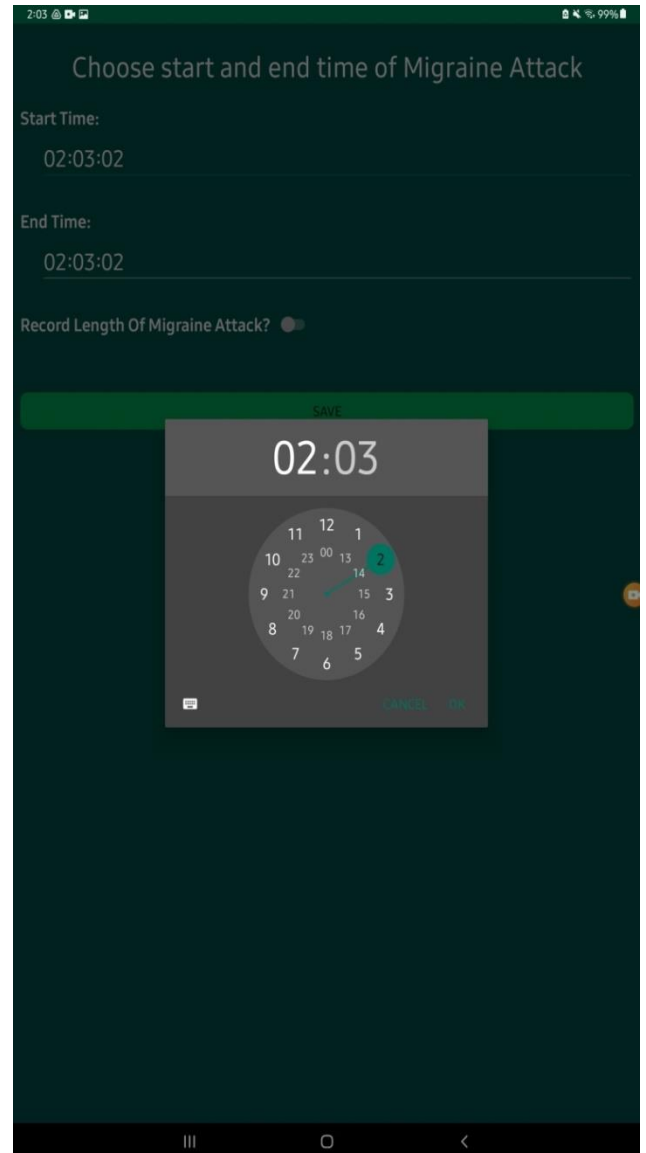


Figure 9 - Time Dialog Picker

Figure 10 shows the time option. This screen will be displayed when a member has selected the time option on the record migraine screen.

On this screen a member can choose the start and end time of their migraine attack. When a user selects either time option a time dialog picker will be presented as shown in *figure 9*. The member can also choose to select the length of the migraine attack with the use of a toggle button.

Once both times have been chosen the member can select the save option, they will then be sent back to the record migraine screen.

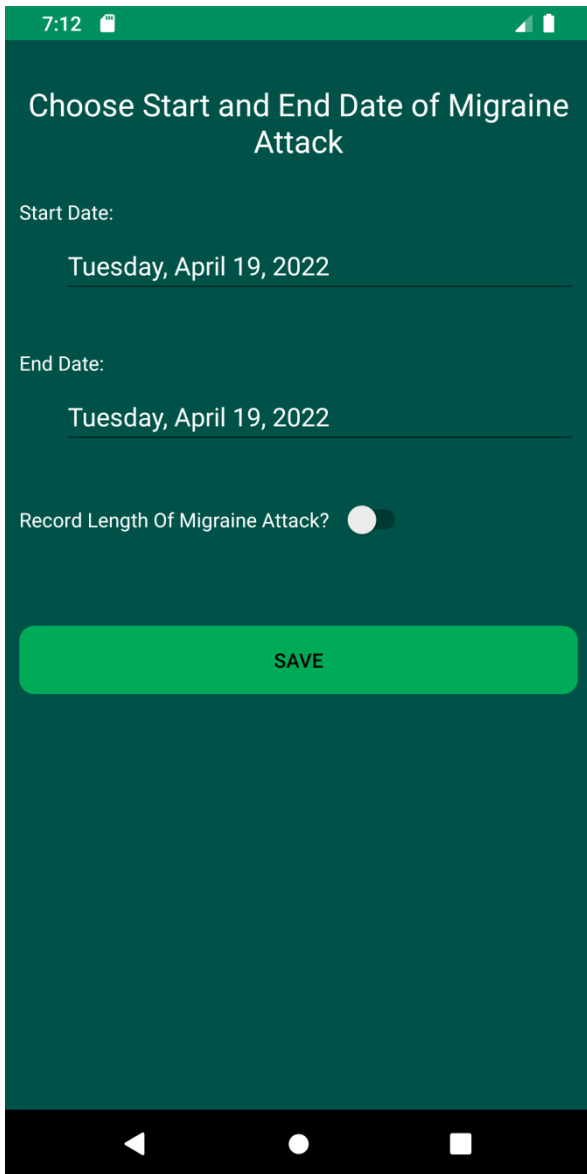


Figure 12 - Choosing Start & End Date

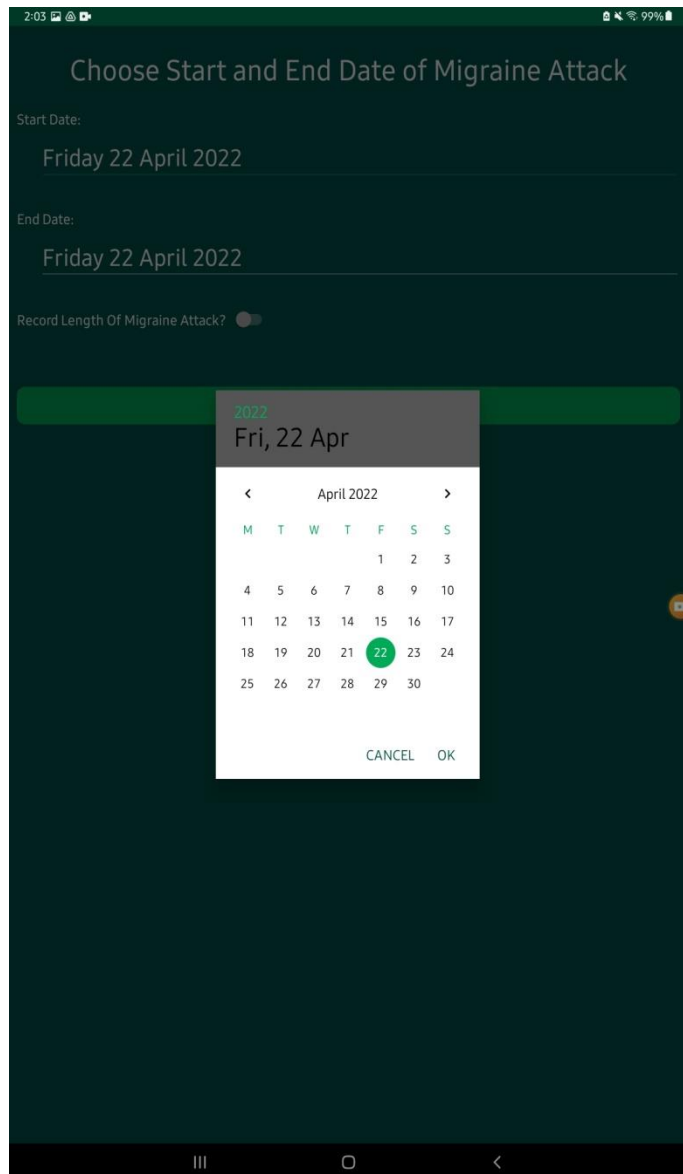


Figure 11 - Date Picker

Figure 12 shows the date option. This screen will be displayed when a member has selected the date option on the record migraine screen.

On this screen a member can choose the start and end date of their migraine attack. When a user selects either date option a date dialog picker will be presented as shown in *figure 11*. The member can also choose to select the length of the migraine attack with the use of a toggle button.

Once both dates have been chosen the member can select the save option, they will then be sent back to the record migraine screen.

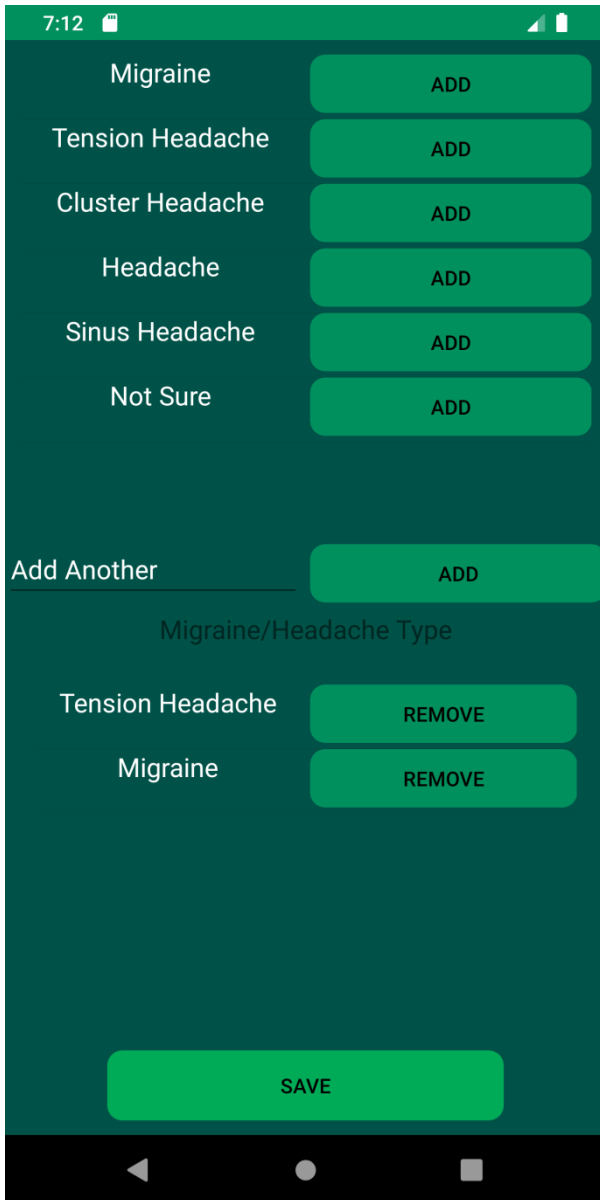


Figure 13 - Record Migraine/Headache Type

Figure 13 shows the record migraine/headache type screen.

A member can navigate to this screen from the record migraine screen by selecting the migraine/headache type option.

On this screen members can select a type of migraine that is currently affecting them. The member can select from a list of options by pressing the corresponding add button or they can enter their own and press that add button.

Once either add button is pressed the option will go into the members list, shown on the bottom half of the screen. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

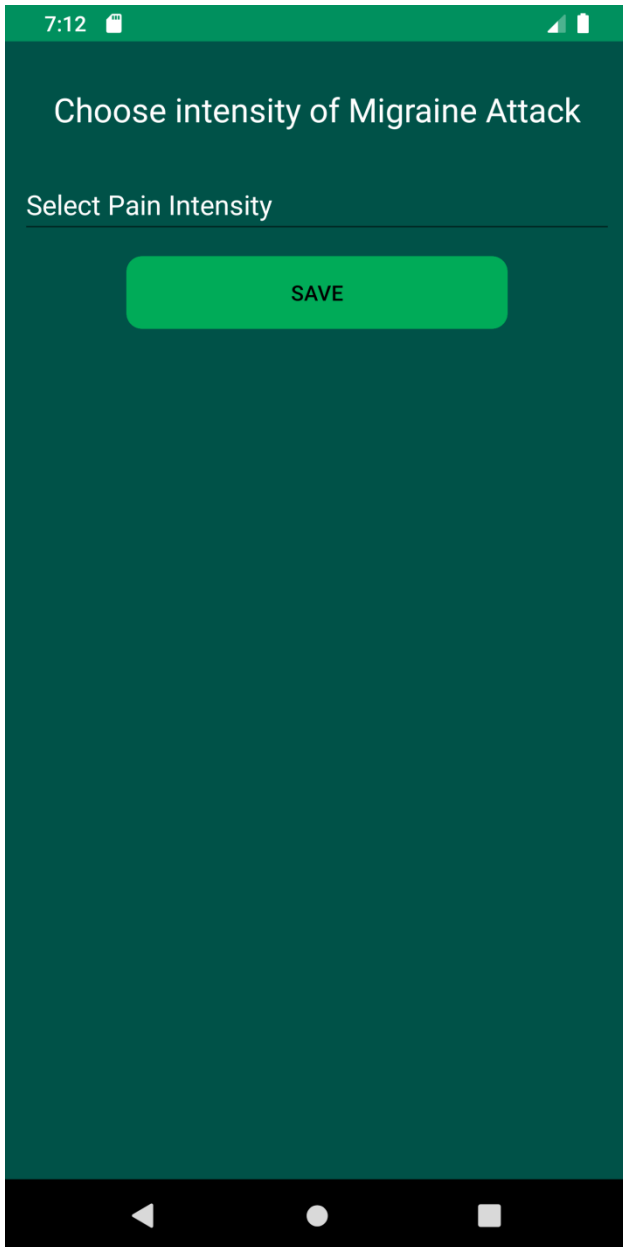


Figure 15 - Pain Intensity

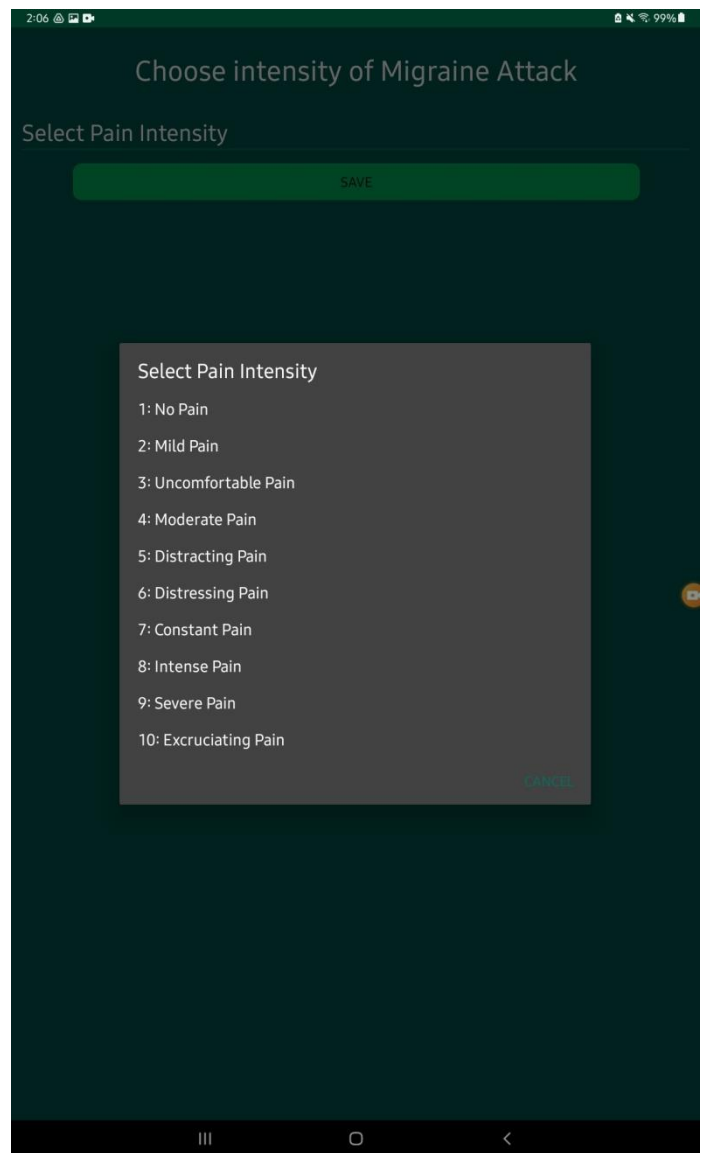


Figure 14 - Selecting Pain Intensity

Figure 15 shows the record pain intensity screen. A member can navigate to this screen from the record migraine screen by selecting the pain intensity option.

On this screen members can select their pain on a 1 -10 pain scale. Once selected members can select the save option, they will then be sent back to the record migraine screen.

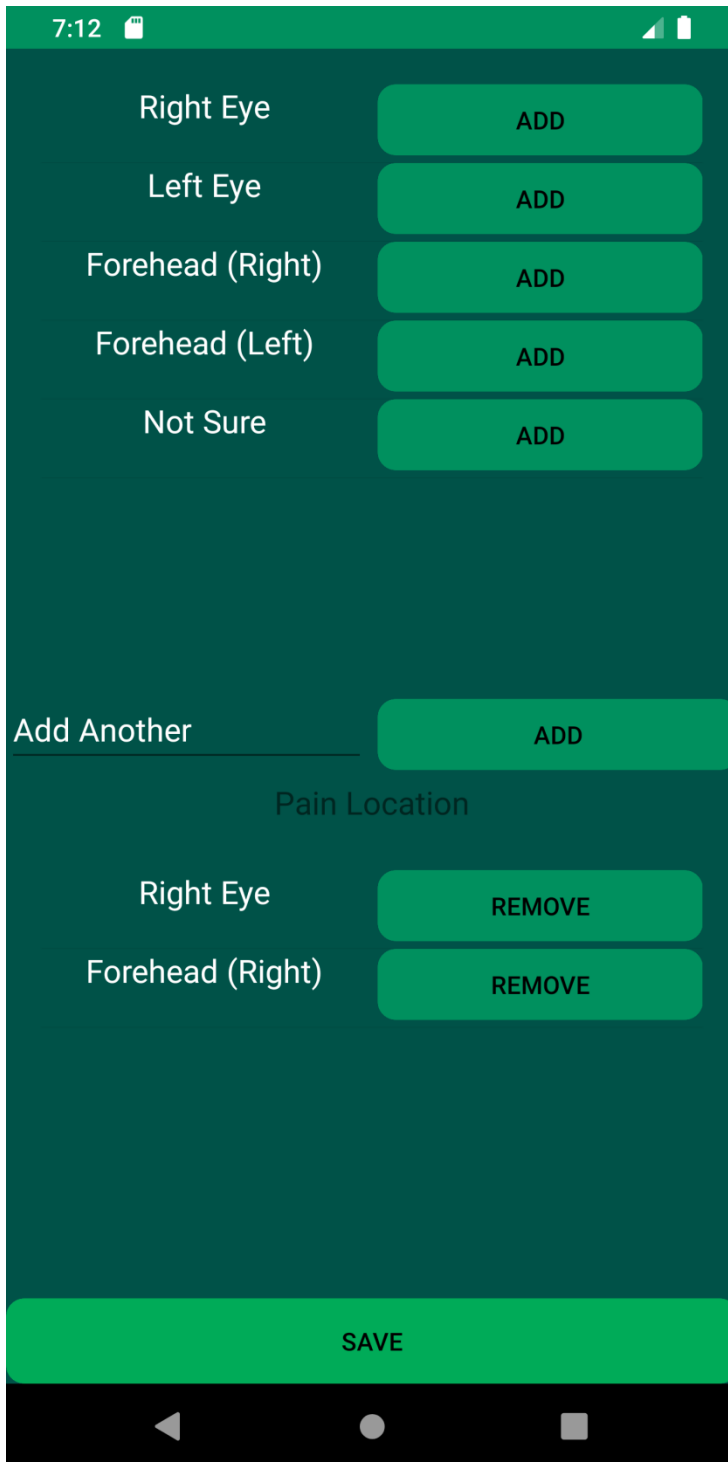


Figure 16 - Pain Location

Figure 16 shows the record pain location screen.

A member can navigate to this screen from the record migraine screen by selecting the pain location option.

On this screen members can select the location of their pain. The member can select from a list of options by pressing the corresponding add button or they can enter their own and press that add button.

Once either add button is pressed the option will go into the members list, shown on the bottom half of the screen. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

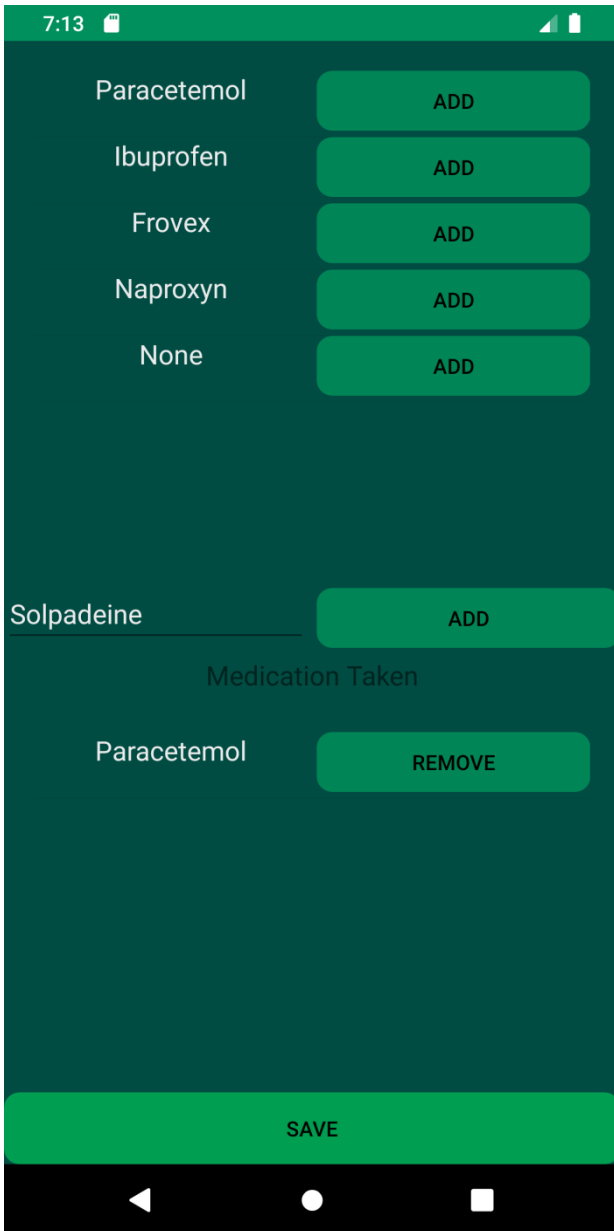


Figure 17 - Medication Taken - Adding Own Option

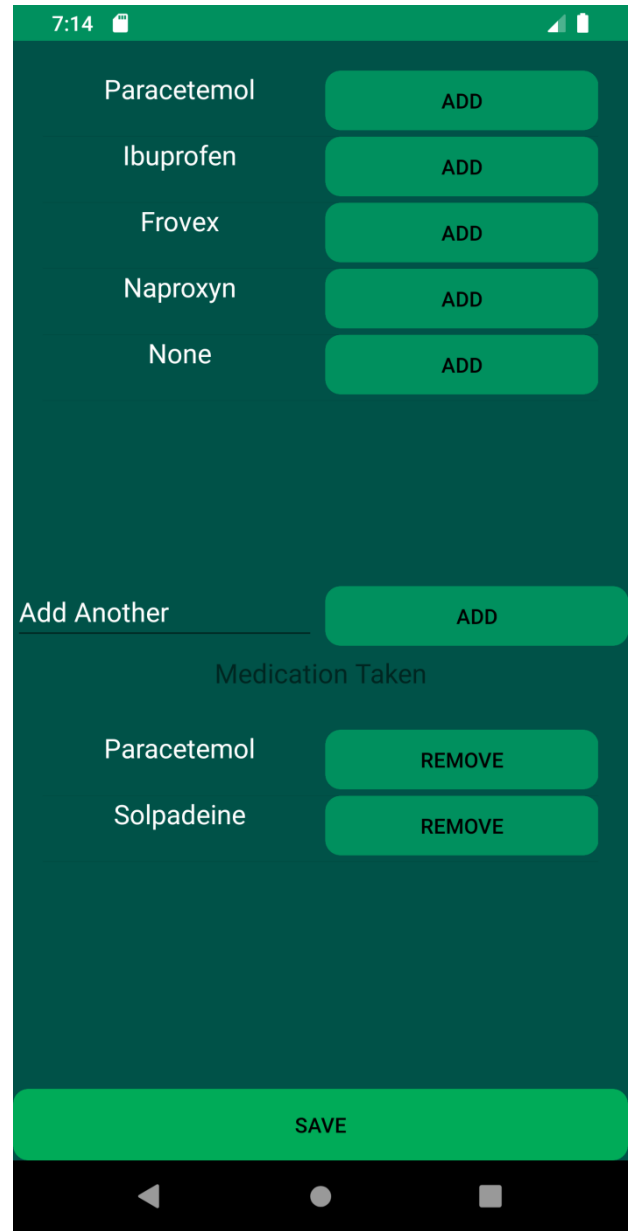


Figure 18 - Medication Taken

Figures 17 & 18 show the record medication taken screens. A member can navigate to this screen from the record migraine screen by selecting the medication option.

On this screen members can select the medication they have taken. The member can select from a list of options by pressing the corresponding add button or they can enter their own as shown in figure 17 and press that add button. Once either add button is pressed the option will go into the members list, shown on the bottom half of the screen. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

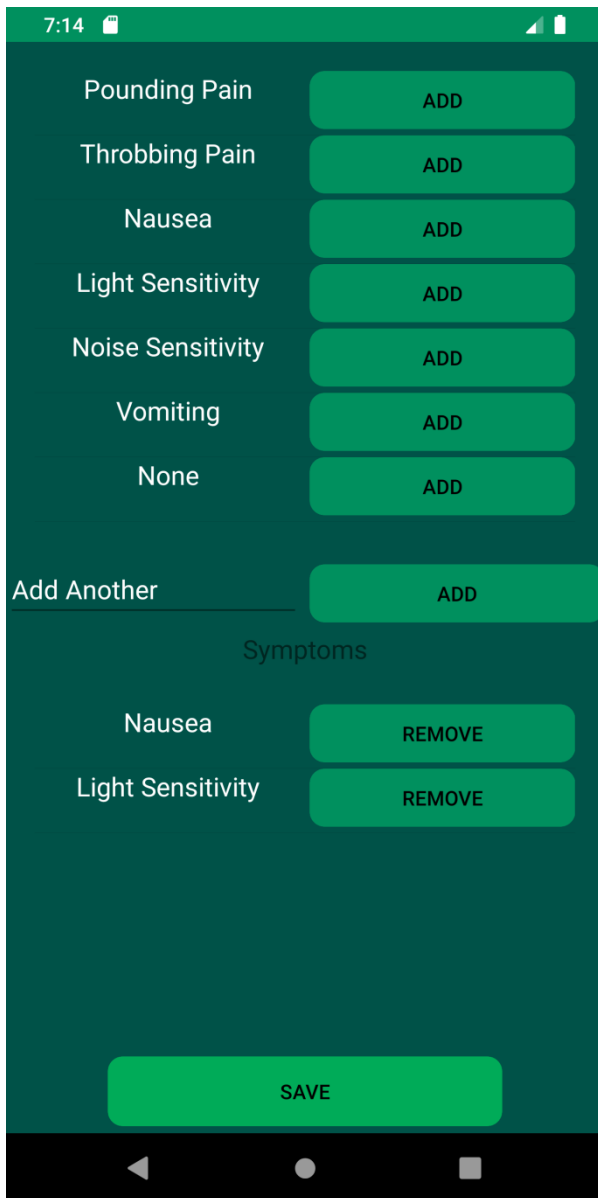


Figure 19 - Symptoms

Figure 19 shows the record symptoms screen.

A member can navigate to this screen from the record migraine screen by selecting the symptoms option.

On this screen members can select their symptoms. The member can select from a list of options by pressing the corresponding add button or they can enter their own and press that add button.

Once either add button is pressed the option will go into the members list, shown on the bottom half of the screen. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

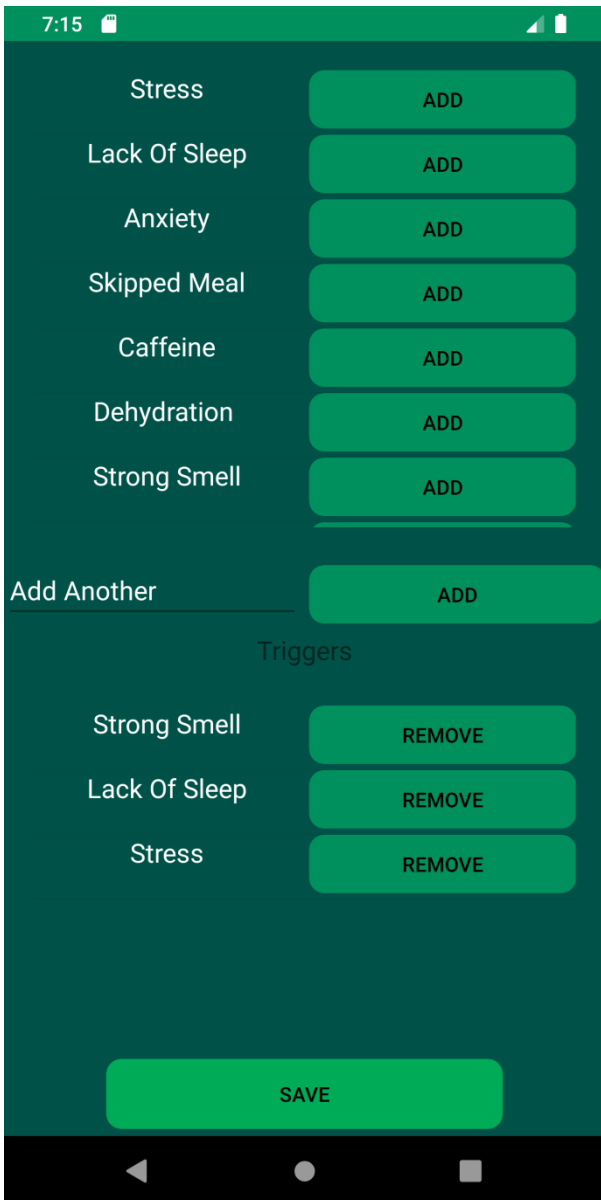


Figure 20 - Triggers

Figure 20 shows the record triggers screen.

A member can navigate to this screen from the record migraine screen by selecting the triggers option.

On this screen members can select their triggers. The member can select from a list of options by pressing the corresponding add button or they can enter their own and press that add button.

Once either add button is pressed the option will go into the members list, shown on the bottom half of the screen. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

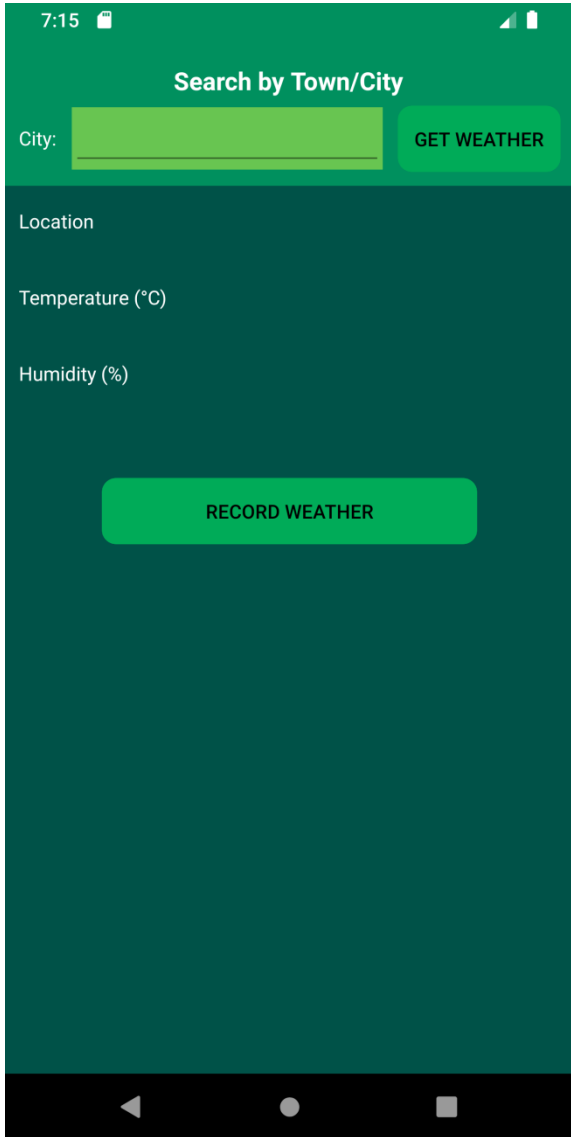


Figure 22 - Record Weather

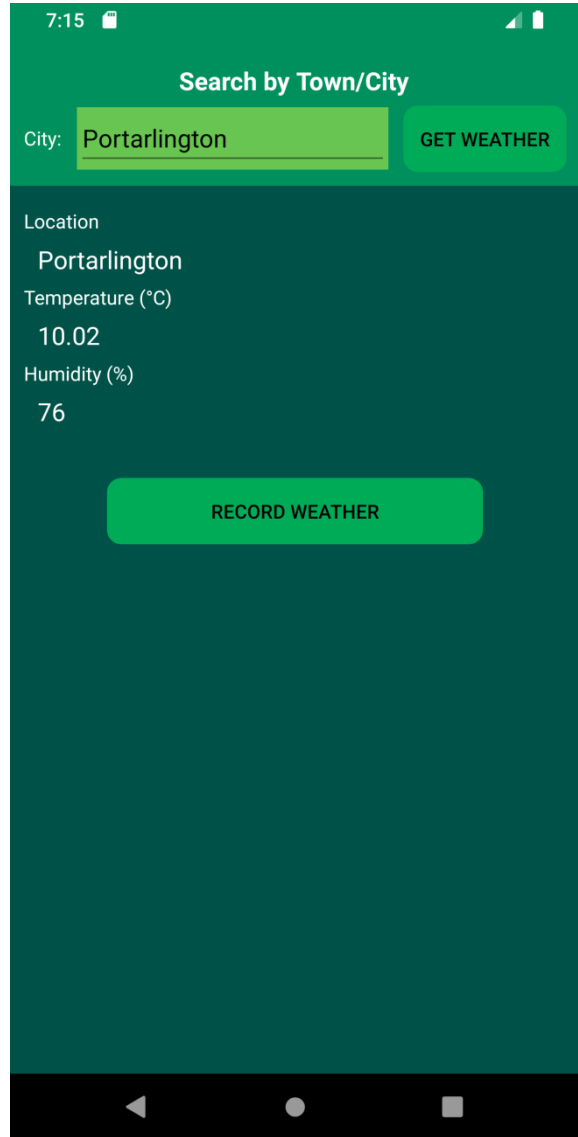


Figure 21 – Record Weather Result

Figures 21 & 22 show the record weather screens. A member can navigate to this screen from the record migraine screen by selecting the weather option.

On this screen members can enter the town/city they are in and press the get weather button to get the location, temperature and humidity for that location. Once this information is displayed the member can select the record weather option, they will then be sent back to the record migraine screen.

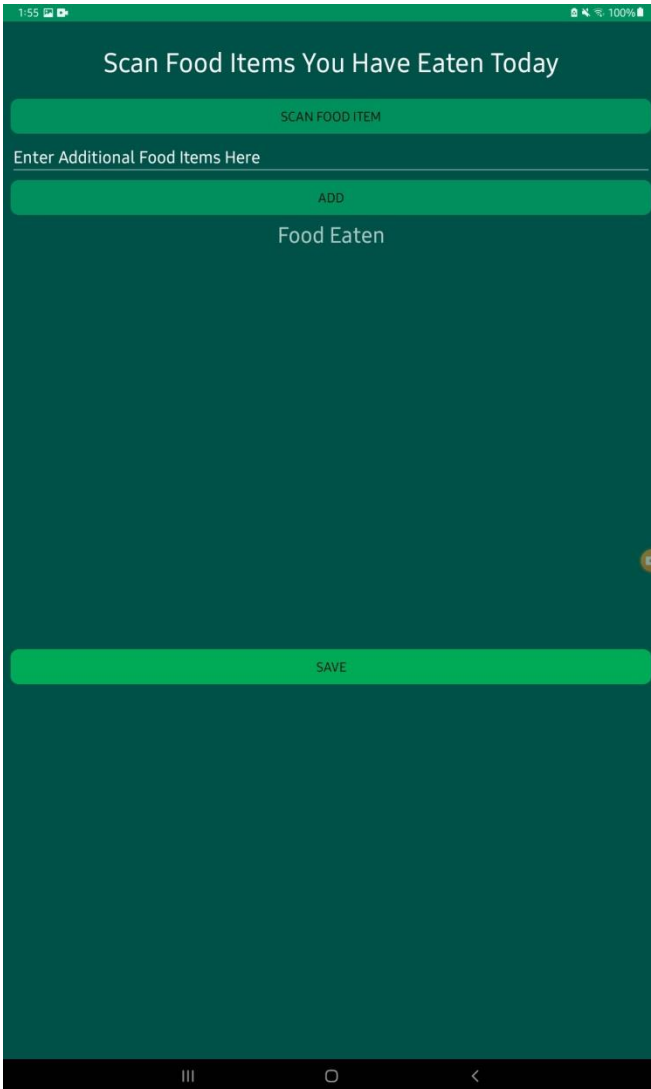


Figure 23 - Record Food

Figure 23 shows the record food screen. A member can navigate to this screen from the record migraine screen by selecting the food eaten option.

On this screen members can enter the food they have eaten. Members can either manually enter food items or select scan food item this will bring them to the barcode scanner screen.

Once food has been added the items will go into the members list. A member can also remove options from this list using the corresponding remove button.

Once the member has completed their list they can select the save option, they will then be sent back to the record migraine screen.

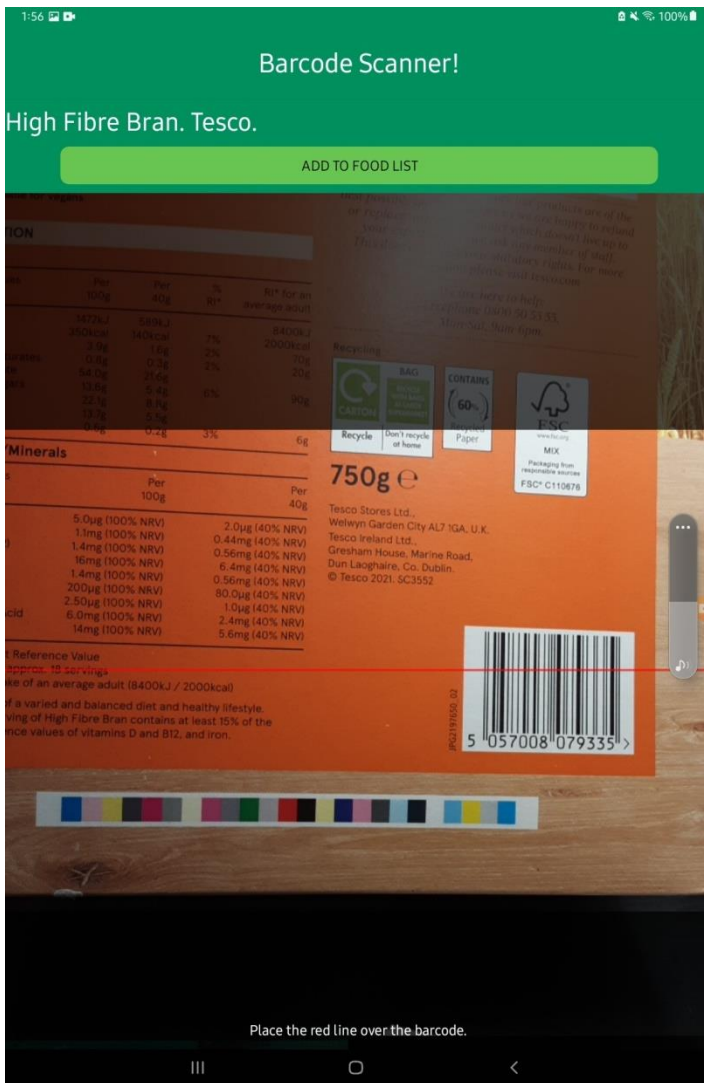


Figure 25 - Barcode Scanner

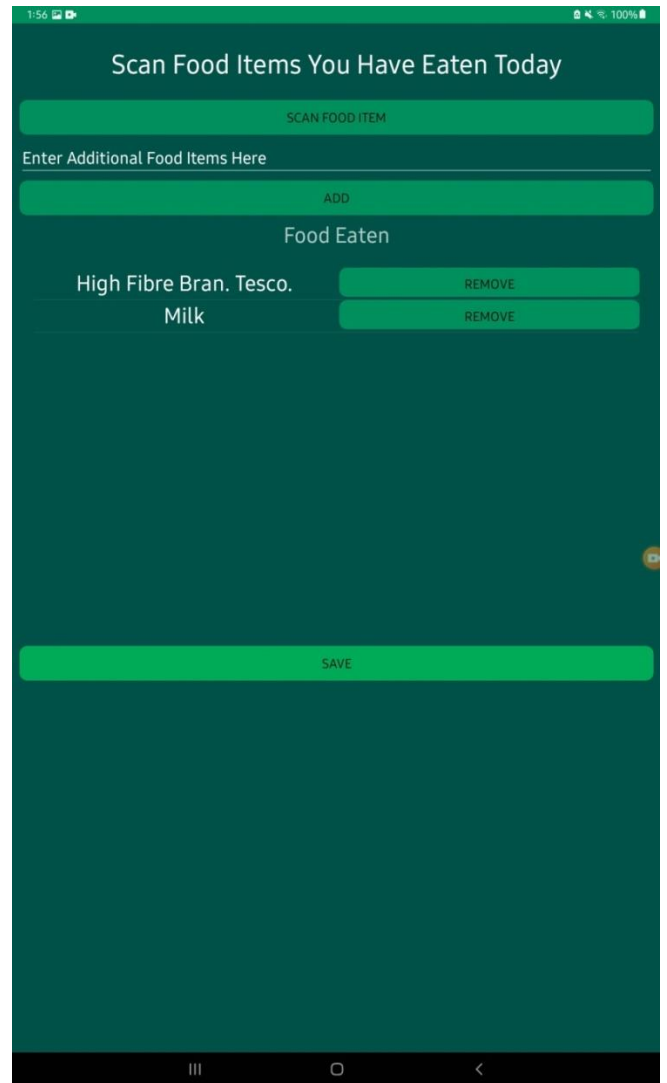


Figure 24 - Food List

Figure 25 shows the barcode scanner screen. A member can navigate to this screen from the record food screen by selecting the scan food item option. On this screen members can scan a barcode by placing the red line shown on screen over the barcode, the item will then show above to be added to the list to do this the member can press the add to food list button. If the food item is not in the openfoodfacts database a message will display informing the member to enter it manually instead.

Figure 24 shows a members food list with both a scanned item and a manually entered item.



Figure 27 - Allergen Checker

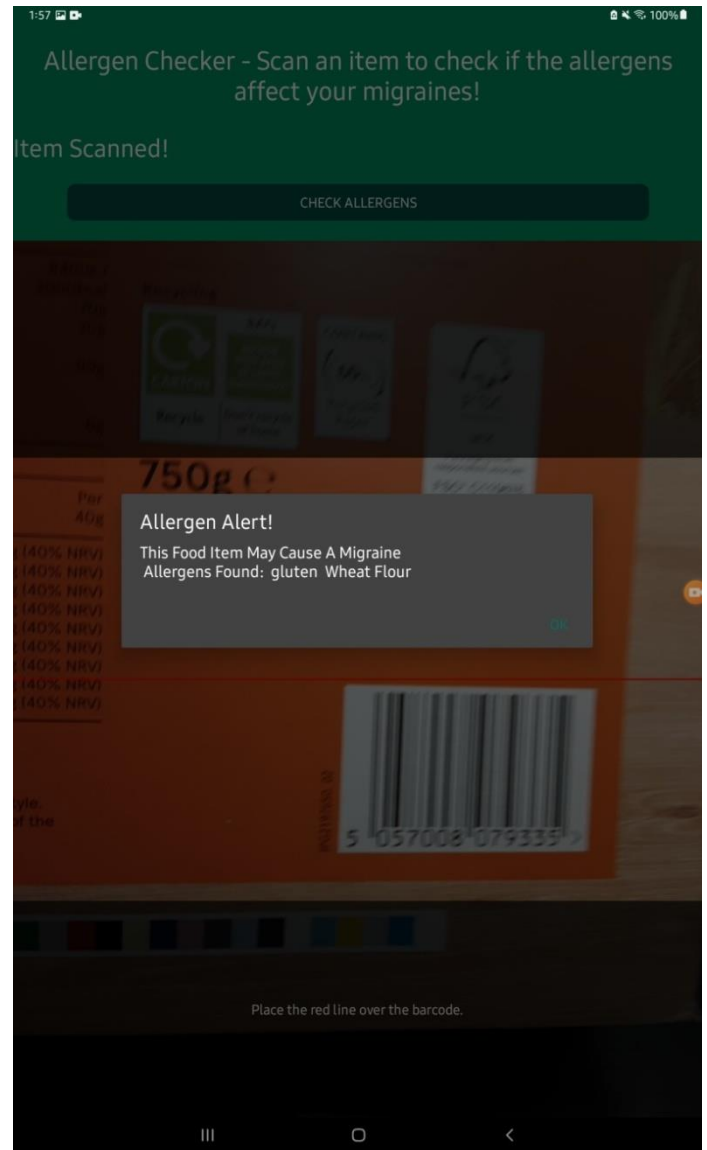


Figure 26 – Allergen Alert

Figure 27 shows the allergen checker screen. A member can navigate to this screen from the main menu screen by selecting the allergen checker option. On this screen members can scan a barcode by placing the red line shown on screen over the barcode, a message telling the member the item has scanned will display the member can press the check allergens button. If the food item has been scanned before when recording a migraine the allergen information will be displayed as shown in figure 26.

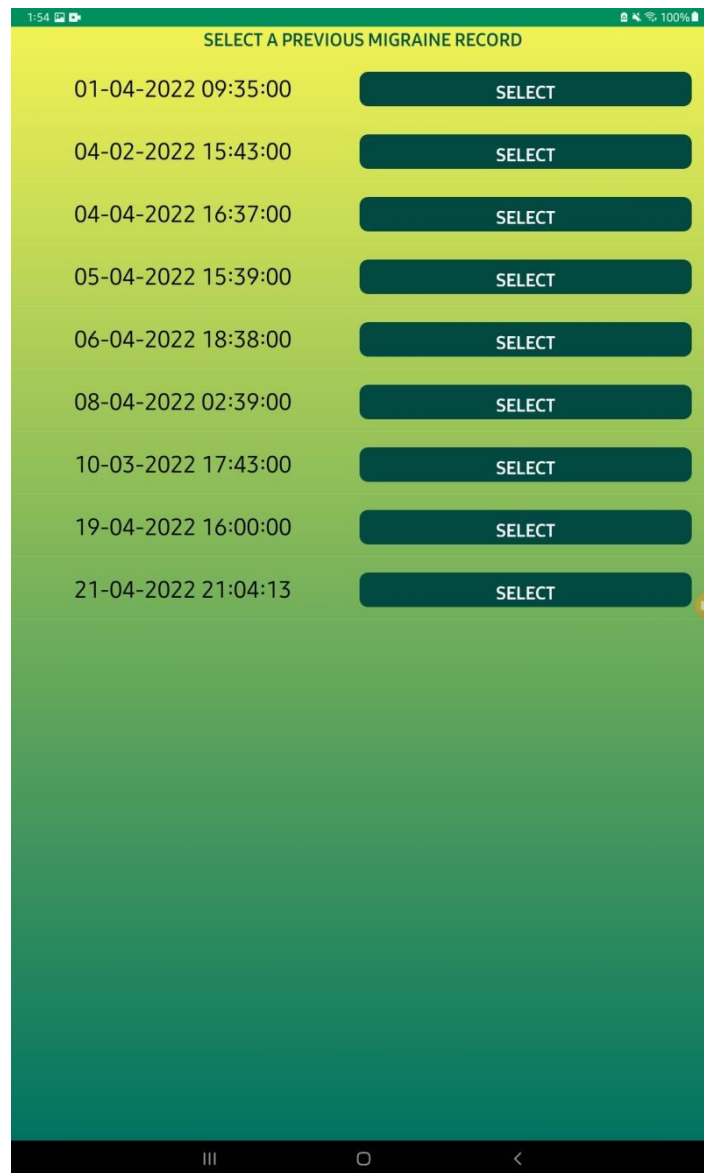


Figure 28 - Previous Records

Figure 28 shows the migraine records screen, this screen is displayed when a member has selected the migraine records option on the home page. On this screen a member can select a previous record to edit or email.

A member can press select on the previous record they wish to view and will be brought the corresponding records screen.

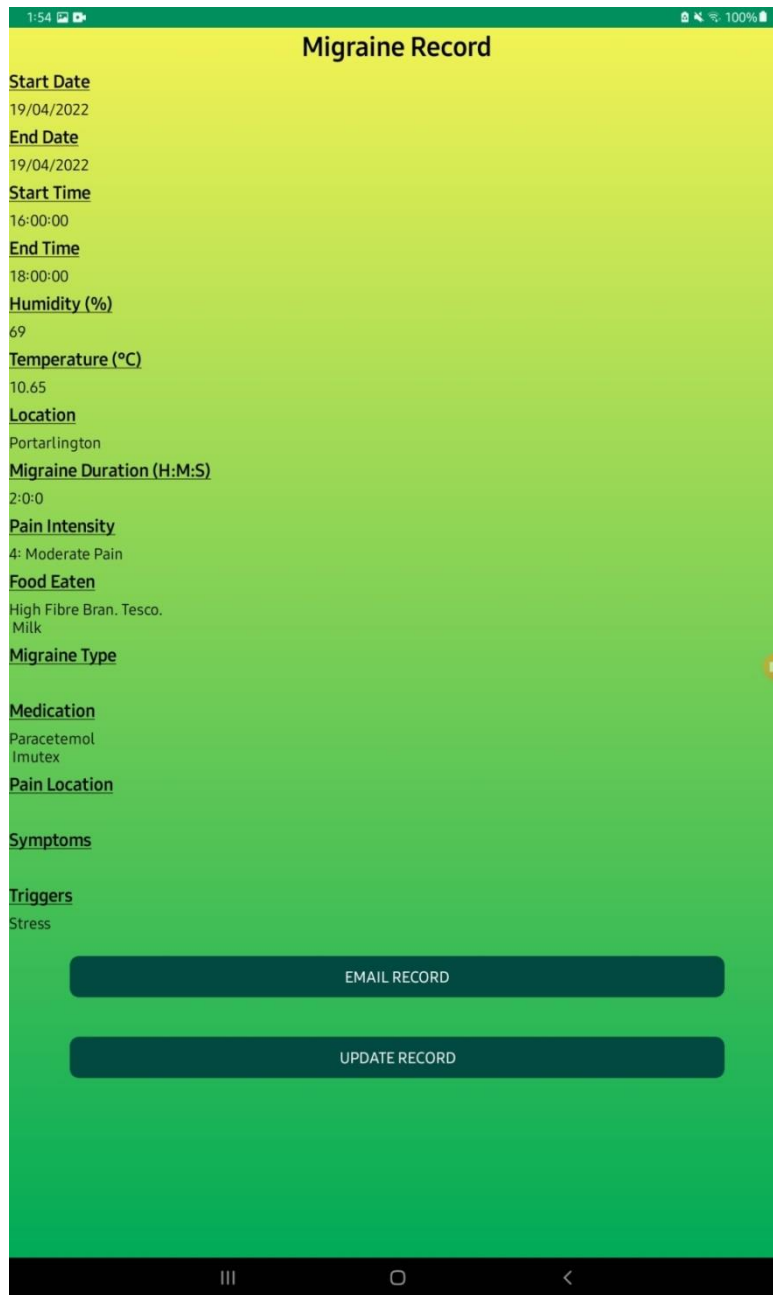


Figure 29 - A Migraine Record

Figure 29 shows a previous migraine record, this screen is displayed when a member has selected a previous migraine record option on the migraine records screen. On this screen the details of a migraine record will be displayed. A member can choose to email this record or update the records details. If they choose to email they will be taken to an email screen, if they choose to update they will be brought to the record migraine screen where they can edit the details of the record.

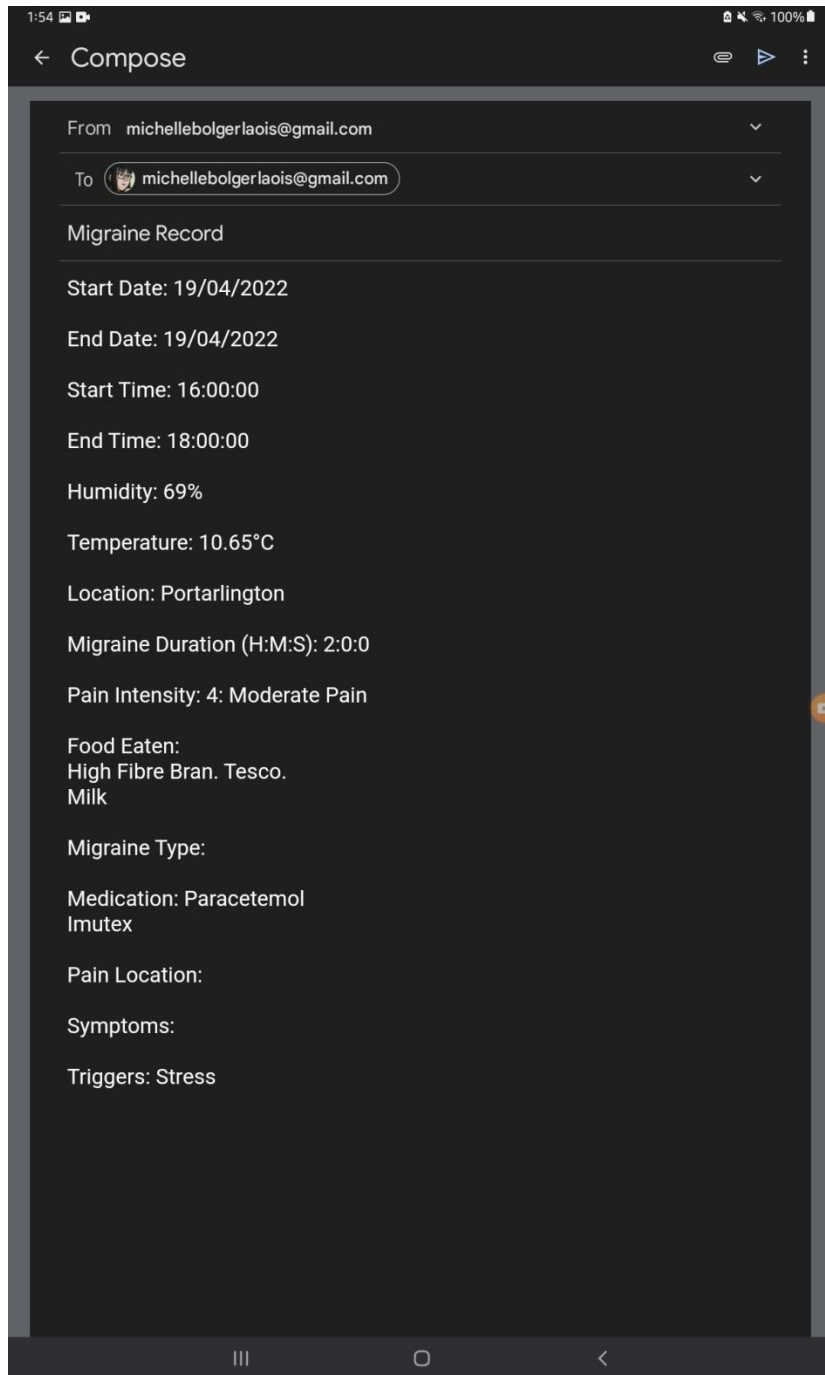


Figure 30 - Email Record

Figure 30 shows the record in an email, this email contains the details about the members chosen migraine record.



Figure 31 –Select A Month

Figure 31 shows each month migraines have been recorded, this screen is displayed when a member has selected the migraine stats option on the home screen. On this screen the months which have migraine records are displayed. A member can choose to look at the statistics of the month of their choice by pressing the select button.

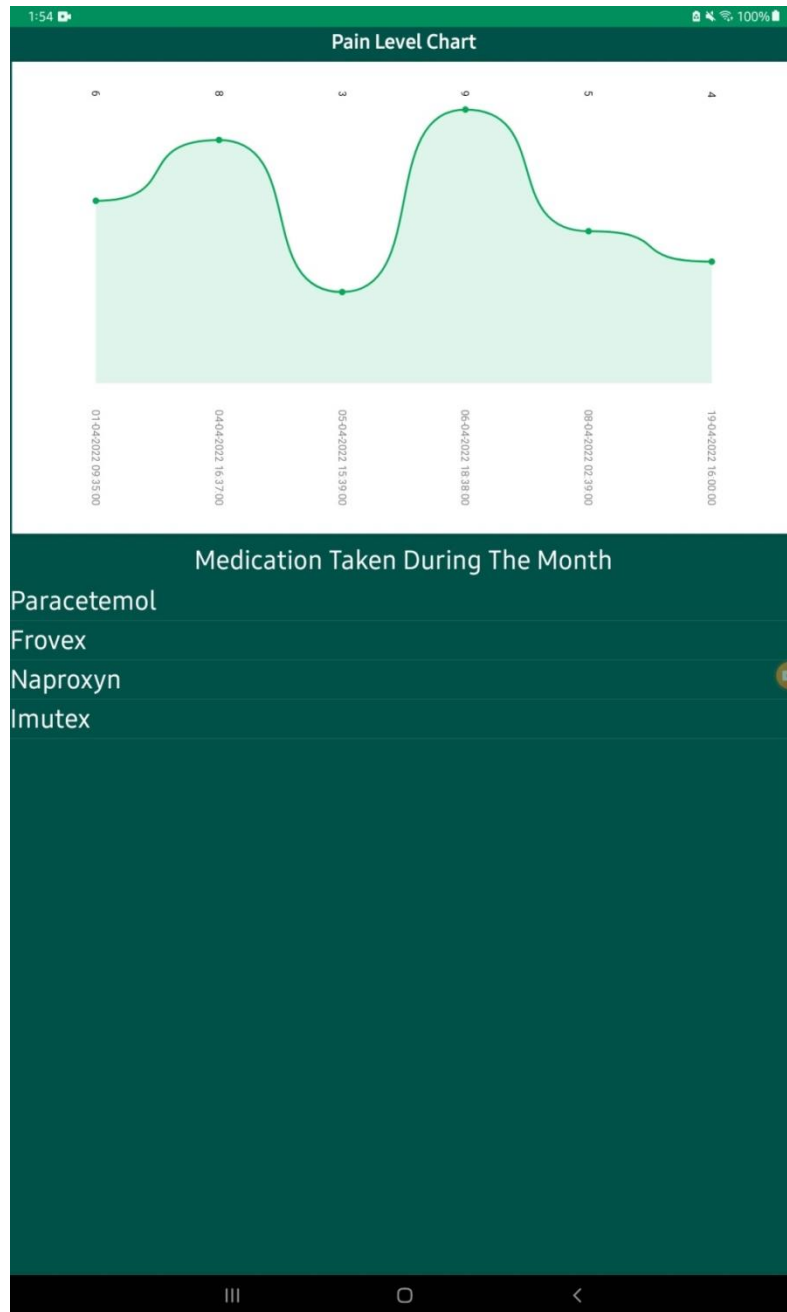


Figure 32 - Migraine Stats

Figure 32 shows the migraine stats for the members chosen month. A graph displaying the pain levels for the month is displayed with the related date. The medications that have been taken throughout the month are also shown.

5. Database Structure



Figure 35 - Database Layout



Figure 33 - Database Layout (member)

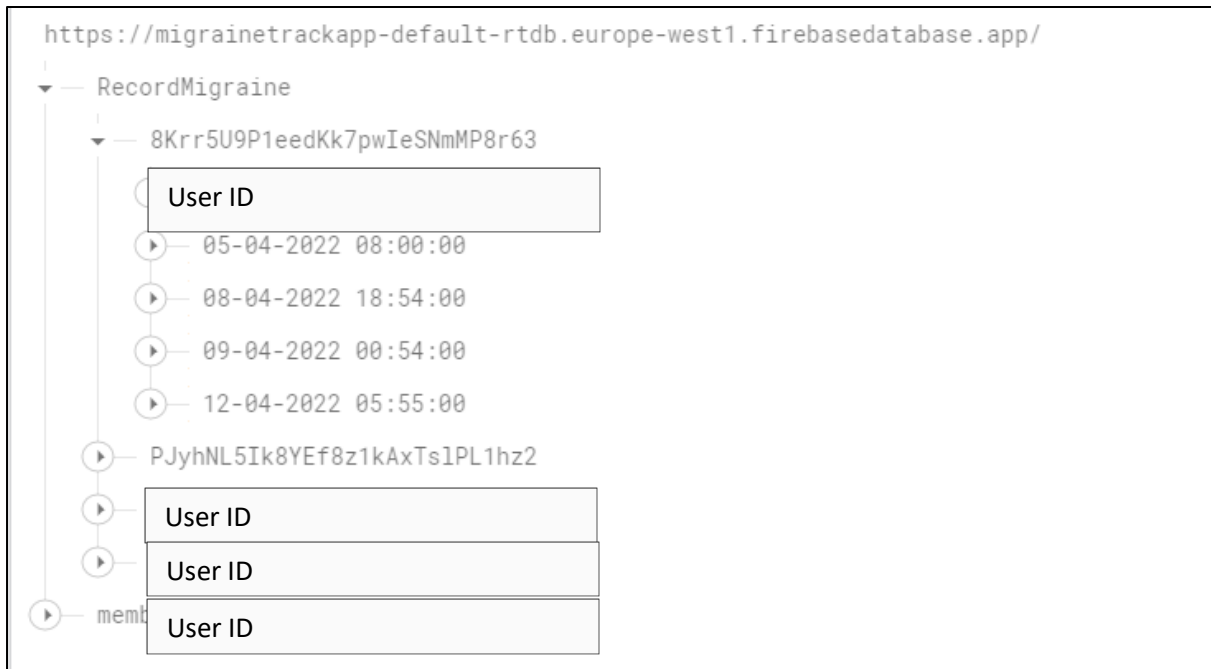


Figure 36 - Database Layout (RecordMigraine)

The screenshot shows a Firebase database record for 'RecordMigraine' at the URL `https://migrainetrackapp-default-rtdb.europe-west1.firebaseio.com/app/`. The record is expanded to show the following fields:

- User ID** (highlighted in a grey box)
- 01-04-2022 13:10:00** (Timestamp)
- dateEntered:** "01-04-2022 13:10:00"
- endDate:** "02/04/2022"
- endTime:** "03:30:00"
- foods**
 - 0: "cheesecake"
- humidity:** "81"
- location:** "Kildare"
- medicationType**
 - 0: "Frovex"
 - 1: "Naproxyn"
- migraineDuration:** "2:20:0"
- migraineType**
 - 0: "Migraine"
- painIntensity:** "9: Severe Pain"
- painLocation**
 - 0: "Left Eye"
 - 1: "Forehead (Left)"
- startDate:** "01/04/2022"
- startTime:** "13:10:00"
- symptoms**
 - 0: "Vomiting"
- temperature:** "7.31"
- triggers**
 - 0: "Skipped Meal"

Below the expanded record, three other records are visible, each with a right-pointing arrow icon:

- 05-04-2022 08:00:00
- 08-04-2022 18:54:00
- 09-04-2022 00:54:00

Figure 37 - Database Layout (Record Migraine) expanded

6. UI/UX Testing

UI/UX testing focused on testing the user interface of the application on potential users. An early version of the application was given to a small group of individuals to use along with a survey to fill out with their findings/issues.

The survey can be found here:

https://docs.google.com/forms/d/e/1FAIpQLSc8dA2N1NBH3fuLpfbg3zOhDegyWz_BU6JBokYpGHn9WkJgbw/viewform?usp=sf_link

	Findings	Fix
1	Can go back to the login screen after logging in	Disabled the back button so users cannot get back to the login screen after the have logged in successfully.
2	Can enter invalid email and password - nothing happens when login pressed	Added a pop up which displays when invalid details are entered.
3	No way to log out	Added a log out button
4	Food scanned in allergen scanner but did not display any allergen information	Added a pop up which displays allergen information, also displays a message when no information about allergens is available from openfoodfacts.
5	Calendar and time pop ups are coloured black - hard to see	Updated the colours on the calendar and time dialog pop ups to improve visibility.
6	Date of birth input too confusing	The DOB was a input field, updated to be date picker.
7	Not enough options when recording a migraine, would be a good idea to let users add their own information	Added in option to allow users to add their own options.
8	The pain scale is a bit too simple	Updated pain scale to add descriptors to each number.
9	The DOB input field is very awkward to use	The DOB was a input field, updated to be date picker.
10	I don't understand the pain intensity scale, it goes from 1 to 10 but is 1 the least or most painful option?	Updated pain scale to add descriptors to each number.
11	The calendar and the clock when recording the migraine information are very hard to see	Updated the colours on the calendar and time dialog pop ups to improve visibility.
12	It would be nice if I could add my own information into the migraine record	Added in option to allow users to add their own options.

7. Issues/Challenges

7.1 Xamarin

Although using Xamarin.Forms has many advantages such as being well documented it does have some faults.

Xamarin implements a feature known as hot reload, this allows developers to quickly see UI changes without the need to reload the simulator. Although this feature was enabled for this project it was not 100% reliable. This feature sometimes worked, did not work at all or presented graphical errors in the UI that were not present within the XAML code.

Attempts were made to solve this issue through researching the bug online and implementing certain fixes, none of those implemented worked and it proved to be an on-going issue although it did not prevent the development of the project.

7.2 Barcode Scanner

Dynamsoft was chosen as the barcode scanner of choice during the beginning of development. This proved to be difficult to implement into the project and also required a licensing fee to function.

To fix this issue, ZXing barcode scanner was implemented into the project instead through downloading the ZXing NuGet package through the visual studio installer.

7.3 Developing for iOS devices

This project was developed to be a cross platform mobile app that can run on both Android and iOS devices. Developing for iOS provided a number of issues and challenges. Firstly was that testing on a physical iOS device proved to be difficult as a physical iOS mobile was unable to be obtained during the development process and also a developer license is required at a cost of 99€.

To test the iOS side of the project a MacBook was borrowed for a short period to run the app through the Visual Studio simulator.

8. Learning Outcomes

8.1 Technical

8.1.1 C#

The biggest learning outcome from this project was developing using C#. Most of the project was implemented using C# and this provided a good opportunity to learn and implement this language.

8.1.2 Working in an Agile Way

This project provided a good environment to work within an agile approach. From the beginning of the project agile working was used. Work was divided into smaller tasks and weekly meetings were held with the project supervisor to receive feedback and discuss the work being carried out and what work could be done in the future.

This project helped to establish the benefits of working in an agile way such as providing continuous delivery and continuous improvement.

8.2 Personal

8.2.1 Time Management

With an increased workload and a large amount of responsibilities due to both the project and the other modules of the course creating plans and schedules was essential.

Each week after the supervisor meeting a plan was created with the most important tasks which needed to be completed for the week ahead. A schedule was implemented using Notion.so to keep track of tasks throughout the duration of the project.

Using plans and schedules helped with time management and ensuring all necessary tasks were carried out adequately.

8.2.2 Presentation Skills

A number of presentations were required during the development of this project to present research to the supervisors and to also keep them updated on the development of the project. Although due to Covid-19 restrictions these presentations were held online through Microsoft

Teams they still provided an excellent environment to practice and develop much needed presentation skills.

8.2.3 Academic Writing & Research

A number of documents were also required for this project to provide knowledge on the complete development process of the project.

The numerous documents were required to follow certain academic standards and writing these documents provided an great method to apply not only academic writing skills.

The volume of research required for the development of this project and the accompanying documents also provided a great environment to gain experience in academic research skills.

9. Project Review

The plan for this project was to develop a cross platform application that will be used by individuals who suffer from migraines to provide them with an application to track their migraines. The application would allow users to track numerous aspects of their migraines such as triggers, symptoms, pain intensity, medication taken and time and date of the attack. Users would also be able to review past records and edit them and also email their records for future reference.

The main functionality of this project was achieved, members who have created a migraineHub account can fully track the aspects of their migraine such as time, date, pain location, pain intensity, medication taken, food eaten, weather, symptoms and triggers.

A big achievement of this application which makes it stand out from other migraine tracking applications available on the market is allowing members to record the food they have eaten when a migraine attack occurs. Food can be a major cause of migraines and implementing this feature can give members an insight into food that may be causing them issues. A barcode scanner was implemented to allow members to scan food items to add into their food list, once this item is scanned the allergens which are listed on the openfoodfacts database are also saved. These allergens can then be displayed to a member when they scan a food item in the future using the allergen checker function.

Members can also edit their past records if they made mistakes or simply added a blank record to finish at a later time. A member can also email these records, this record can be used by the member to give to their doctor or neurologist for review.

Members can also view stats about their migraines. The stats they can view include a line chart displaying the pain levels of all the migraines they had for a certain month, this can help a member as visually representing their pain can help them see what they are experiencing. The medications they took throughout the month are also displayed, these stats can help members understand if the medications they are taking have any effect.

A number of aspects were left out of the finished project such as a sleep tracker and menstrual tracker. These aspects were dropped due to time constraints.

If the project was begun again strong consideration would be given to creating a web app alongside the mobile app. This web app would be used by a health professional to review a member's migraine records, a messaging function could also be implemented to allow a member to talk to a health professional without the need to schedule in person or online appointments.

10. Conclusion

In conclusion this report has fully documented the development of the migraineHub application. This document has provided full descriptions of the completed project as well as the technical aspects.

The final UI/UX has been shown and discussed in detail showcasing how potential users will interact with the application.

The issues that were encountered during the development process have also been fully discussed in detail along with how these issues were overcome. Both technical and personal learning outcomes were also provided.

Finally a review of the completed project was also provided along with a personal reflection on the project's learning outcomes and achievements.

Appendices

4/22/22, 5:42 PM migraineHub UI/UX testing

migraineHub UI/UX testing

* Required

1. Please detail any issues you had when using the app. *

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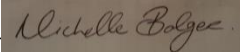
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