

FITNESS AND HEALTH APPLICATION FOR ELDERLY

BY

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ABSTRACT

This project is conducted in the field of health informatics and mobile application development, with a focus on designing a fitness and health application for tailored for elderly users. For the existing fitness and health apps such as MyFitnessPal, Fitbod, Fitbit, and OKOK International, can be characterized by such limitations as complicated and non-user-friendly interface, the use of paid subscriptions or other external devices, insufficient support of caregivers and the lack of motivation strategies that could be used by seniors. These failures demonstrate the criticality of a solution that puts the elderly population in the first place, with both accessibility, safety and long-term engagement. The proposed system will use a user-centred approach to this issue, based on the Software Development Life Cycle (SDLC) featuring prototyping. Some of the features that are integrated into the application include large fonts, voice assistance, simple navigation, emergency SOS button, caregiver monitoring and health simplified tracking. Progress reporting, milestones and positive reinforcement will be used in the system. The research process will be conducted in the form of requirement analysis, interface prototyping, Expo and Firebase development and the evaluation process are conducted through the iterative process with the involvement of the user to confirm the usability. It is expected that the results will be the intuitive, safe and reliable application that will enable the elderly users to be able to begin living healthier lifestyles, stay independent and improve their attachment with the caregivers and family members. Finally, this research paper also offers a viable and long-term remedy of enhancing management of elderly health with the help of mobile technologies.

Area of Study (Minimum 1 and Maximum 2): Mobile Application Development, Health Informatics

Keywords (Minimum 5 and Maximum 10): Elderly health, Fitness Tracking, Health Monitoring, Mobile Application, Fitness Technology, Emergency SOS, Personalized Coaching

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LIST OF SYMBOLS

LIST OF ABBREVIATIONS

<i>2FA</i>	Two-Factor Authentication
<i>CRUD</i>	Create, Read, Update, Delete
<i>ERD</i>	Entity Relationship Diagram
<i>FK</i>	Foreign Key
<i>PK</i>	Primary Key
<i>RAM</i>	Random Access Memory
<i>UCD</i>	User-Centered Design
<i>UML</i>	Unified Modeling Language
<i>UI</i>	User Interface
<i>UX</i>	User Experience
<i>SUS</i>	System Usability Scale
<i>AI</i>	Artificial Intelligence
<i>SSD</i>	Solid-State Drive
<i>HDD</i>	Hard Disk Drive
<i>GB</i>	Gigabyte
<i>GPU</i>	Graphics Processing Units

Chapter 1

Introduction

Recently, there were a lot of fitness and health applications appeared but many of them are designed with younger, tech-savvy users in mind. However, most of the elderly is facing the common issues which they are hard to learn a new technology and some of them decline to use mobile phone [9]. To solve these problems, this Fitness and Health application for elderly is specifically designed to support the elderly by providing a user-friendly, simple and safe digital companion that encourages healthier lifestyles.

This application will mainly design with large fonts, clear icons, voice assistance and one-tap navigation. It offers easy features for elderly and offers personalized low-impact exercise routines with guided illustrations and videos that are safe and suitable for them. Besides, we have designed a reminder function for medication intake and medical appointments daily to help maintain consistency. A basic health tracking system can help to monitor their health metrics such as calories burned, water intake and sleep hours and will be displayed in a clean dashboard.

Since it is designed for elderly people, this application has an always-visible emergency SOS button which allow the seniors to quickly reach caregivers or family members when urgent situations. By combining accessibility, safety, and engagement, this Fitness and Health Application for elderly empowers elderly users to stay active, manage their health and maintain a better quality of life while staying connected with their loved ones.

1.1 Problem Statement and Motivation

Problem Statement

1. Lack of Accessibility and Ease of Use

Nowadays, most fitness and health applications are designed with a lot of features and functions for younger and tech-savvy users. For example, small fonts which able to integrate with different features in a page, complex dashboards showing different records and hidden tabs which are not friendly for elderly especially those with vision impairments, reduced motor skills or difficulty learning new technologies. This kind of application failed to meet the needs of the elderly population [6].

2. Limited Support and Safety Features

The existing fitness and health applications are more focused on self-monitoring and personal motivation with little caregiver integration and emergency response. The presence of the family and access to help immediately is one of the importance to the elderly. Some of the functions such as tracking the progress of their caregivers independently, enjoying real-time progress updates and always having an emergency SOS button, these apps cannot guarantee the safety and reassurance of the elderly [5], [7], as well as the long-term interest and commitment.

3. Poor Motivation Strategies for Seniors

Competitive gamification and leaderboards plus challenges are mostly aimed at younger users and most fitness apps. These characteristics can be threatening or useless to elderly, who react better to mild encouragement, a straightforward progress indicator and positive feedback [8]. The elderly, in the absence of age-appropriate motivational strategies tend to lose interest or become discouraged in working towards their fitness.

Motivation

These problems were important because when the problems were fixed, elderly can use more accessible, safe and motivating tools to successfully adopt and maintain healthy lifestyle habits. It is important to let elderly people know their health situation and motivate them to do light exercise [7], [8] to prevent some disease. The application will allow seniors to use fitness routines easily and with confidence, which is a significant step in breaking the barrier that more commonly than not causes them to not use technology effectively.

The support and safety elements are also important, since the option to have the caregiver integrated, real-time monitored and have an emergency SOS button can be soothing to both the elderly and their families. By integrating these functions, it can strengthen user trust, reduce risks and increase consistency and long-term engagement with the application. Besides, replace the competitive gamification and leaderboards with simple progress indicators, gentle reminders especially with voice reminding and positive reinforcement can provide some motivation for the elderly to hit the achievement without unnecessary pressure.

As a result, solving these problems can transform the application into more than a tracking tool. This simple application allows the elderly to learn with effort and become a supportive digital companion that helps elderly users to improve their physical health, maintain independence and enhance their quality of life in a sustainable way.

1.2 Objectives

1. To develop a fitness and health app with an accessible and user-friendly interface

To design a system with large fonts, clear icons as well as few steps in its navigation and will be appropriate to users with reduced motor skills or vision impairments for those elderly population who often face difficulties with existing applications. The application will be designed to help the elderly to communicate with the system by themselves, become confident in using digital tools and change their lifestyle by adopting healthier behaviors without becoming frustrated because of the overly complicated dashboards and unclear features.

2. To integrate comprehensive support and safety features into fitness and health applications

Some elderly users need reassurance and rapid access to help in case an emergency occurs. The system will be fitted with an emergency SOS button to offer urgent help in case of need hence making sure that one can always get help. The objectives of the functions are not only to make elderly users feel more safety but also to encourage a long-term commitment, in this sense, the availability of assistance and emergency facilities enhances trust and confidence in the application as a reliable health management tool.

3. To implement motivational strategies that are age-appropriate and supportive rather than competitive

To motivate elderly users to stay with their health and fitness routines, the proposed system will focus on offering mild motivation through notifications, simple progress displays and compliments other than traditional applications that rely heavily on gamification features such as leaderboards, streaks and challenges which may demotivate the elderly users. Milestone celebrations, easy achievement badges, and progress summaries will be created to encourage the users, but they will not be too many [7], [8]. In this way, the application will aim to keep the user engaged in the long-term, minimize the chances of disappointment and help the elderly population to create sustainable and enjoyable fitness habits.

1.3 Project Scope and Direction

The scope of the project, which is the fitness and health application, is mainly developed for the elderly population. Since many elderly individuals face difficulties while they try to use any existing fitness and health application [6], [9] because of the complex user interface, lack of safety features and limited caregiver support. The proposed application will concentrate on offering elderly with easier, more reachable and convenient platform to monitor and manage their overall health. This application will support the elderly to stay healthier by integrating some features such as exercise, nutrition, hydration and sleep patterns tracking and emergency assistance. The scope of this project will therefore emphasize accessibility, safety and ease of use to specifically cater to the needs of the elderly community.

1.4 Contributions

When this study is finished, other scholars can use it to compare in the field of elderly-focused fitness and health applications. Meanwhile, when other researchers try to conduct any research on this title, they can use some references. Through this article, developers can learn how to enhance the system and incorporate new features. When they read this essay, they might get more ideas. Besides, the users might have a better experience because they can effectively manage their health. Above all, the contribution is spread to elderly users themselves, whose experience of using the application allows them to monitor the daily activity and help track key health indicators. With the addition of reminders, emergency help and soft encouragement, the system not only makes the elderly lead healthier lives but also allows them to remain independent and confident in their ability to take care of themselves.

1.5 Report Organization

The structure of this report is organized as follows. In **Chapter 1**, the introduction of the project by presenting the problem statement and motivation for developing the Fitness and Health Application for elderly with user authentication are discussed, highlighting the inefficiencies of traditional fitness and health application that doesn't suit to elderly, the need for secure authentication and prioritization challenges, followed by the research objectives, scope and direction targeting elderly in Malaysia, and the contributions of the project. This chapter is to find out how an accessible, safe and supportive digital fitness and health assistance should be created for elderly.

Chapter 2 provides a review and comparison of existing fitness and health applications, such as MyFitnessPal, Fitbod, Fitbit and OKOK international to identify their strengths and limitations, which shaped the conceptual direction of the proposed application with those useful features that support elderly while using the application.

Chapter 3 describes the system methodology and approach which includes the User-Centered Design (UCD), system architecture diagram, use case diagram of fitness and health application for elderly and their corresponding descriptions, as well as the activity diagram. This chapter outlines how the core features such as medication reminders, exercise library, daily health logs and emergency SOS support are perfectly integrated within the proposed application.

Chapter 4 presents the system design that includes system block diagram, class diagram, entity relationship diagram (ERD) which demonstrates the structural design, how the data is stored and the relationships between different system components and lastly the project timeline. This chapter ensures that the design is aligned with the project objectives, this design not only guarantees that the application will work, but also facilitates its maintainability, scalability and practical utility for the end users.

Chapter 5 describes how the application being implemented, including the hardware and software setup and the system operation that comes with every single interface screenshot and their descriptions. In addition, it explains the key implementation issues and challenges that were found during the development of the application and how they were addressed.

Chapter 6 explains the results of system evaluation and discussion. This chapter is about the system testing and performance metrics to ensure the expected output is matched with the actual output, as well as project challenges, objectives evaluation and a simple system evaluation that collect the responses from elderly users with System Usability Scale (SUS) and the results finally concluded and displayed in pie charts.

Finally, **Chapter 7** concludes the report by summarizing the key findings, reflecting on the project outcomes and suggesting potential future enhancements recommendation such as enhanced medication reminders, additional guidance exercise video, favorite exercise features, gentle motivation and others.

Chapter 2

Literature Review

The recent mobile health application has gained a lot of importance in focusing on fitness features, self-management and healthy ageing of the elderly. Some applications have the capabilities of tracking calories consumed, physical activity, heart rate, sleep and other health related data allowing users to monitor behavioral changes over time and make better informed lifestyle choices [1], [2]. On the same note, they also did integrate with Bluetooth scales to provide body-compound analysis, assisting users in monitoring such data as BMI, muscle mass, and hydration levels as a part of day-to-day health management [4]. Recent research on mobile health system design targeting the elderly has noted that age-friendly usability, including simplified navigation, simulated text size, and reduced cognitive load, is critical to ensure maximum adoption and sustained use [11], [12]. In general, available evidence proves that properly designed mobile health applications have great potential in support of physical activity, tracking health indicators, and improves quality of living of elderly people through the availability of convenient, user-friendly and data-driven support.

2.1 Previous Application

2.1.1 MyFitnessPal

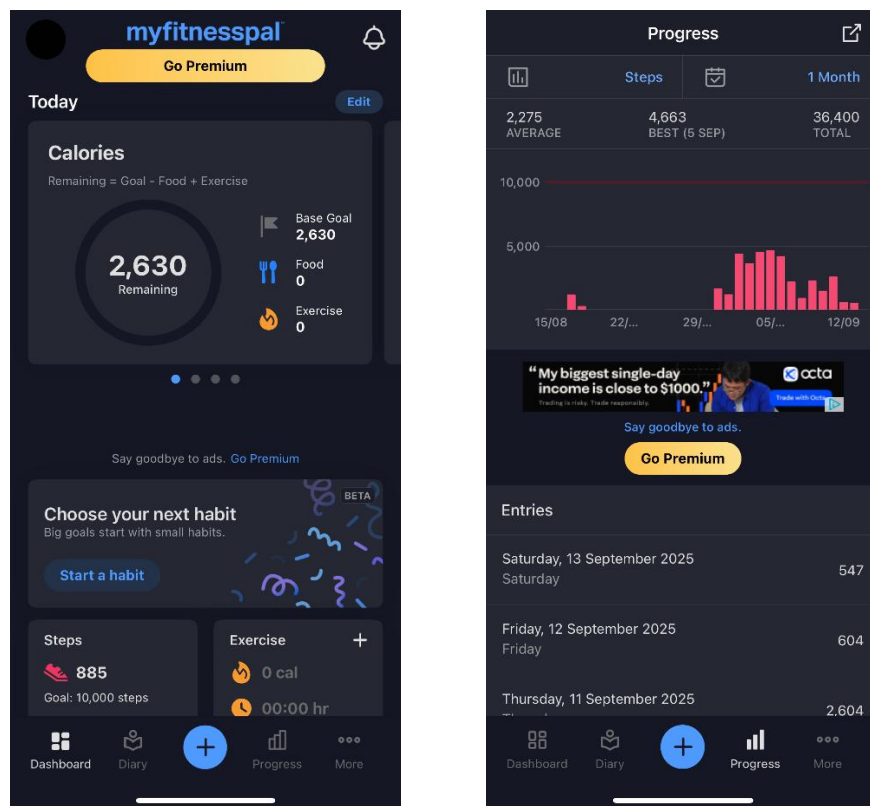


Figure 2.1 MyFitnessPal Application

MyFitnessPal is a widely used fitness and health tracking application that helps users to track their daily food eaten, physical activity and health goals. It provides a large food database on calories and nutrient tracking which can be synchronized with wearable devices and fitness apps and allow users to set personalized weight and fitness targets. Besides, it provides data charts and reminding system which support users to manage their daily diet and physical activity to lead to a healthier lifestyle [1].

2.1.1.1 Strengths and Weaknesses of MyFitnessPal

Strengths

1. Large Food Database

- MyFitnessPal provides a huge database of foods and you can log in with your daily meals and get detailed information on nutritional values of foods.

2. Personalized Goal Setting

- MyFitnessPal allows users to set personalized goals such as losing weight, gaining muscle or gaining weight along with some specific macronutrient or calories targets.

3. Allows Integration with Other Devices or Applications

- This application can connect with different fitness trackers and health applications so they can track their diet and physical activity information.

4. User-Friendly Interface

- MyFitnessPal comes with simple user interface, design and navigation which allows different age groups to use.

5. Provide Motivation and Monitoring

- This application has some extra features such as progress charts, reminders and achievement notification make users feel motivated to use the application and consistent with their fitness process.

Weaknesses

1. Less Functionalities in Free Version

- There are some functions not available if the user does not pay for the subscription, such as the ability to analyze nutritional information, meal insights, individual macro goals, and others.

2. Validity of User-Generated Data

- The database contains some food entries that can be inputted by the user and thus have errors or inconsistencies, which can influence the accuracy of calories and nutrient tracking.

3. Time-Consuming Data Entry

- Recording every meal and workout progress is a time-intensive process. If the user is lazy or extremely busy, it will result in a low level of long-term use.

4. Privacy and Data Concerns

- The issues of data sharing and privacy policies have been raised by users, particularly following the data breach that MyFitnessPal had previously encountered.

5. Focus on Calories Counting Over Health Control

- The application pays excessive attention to calorie counting, which might not be sufficient to support healthy eating habits and food-related mental health.

2.1.2 Fitbod

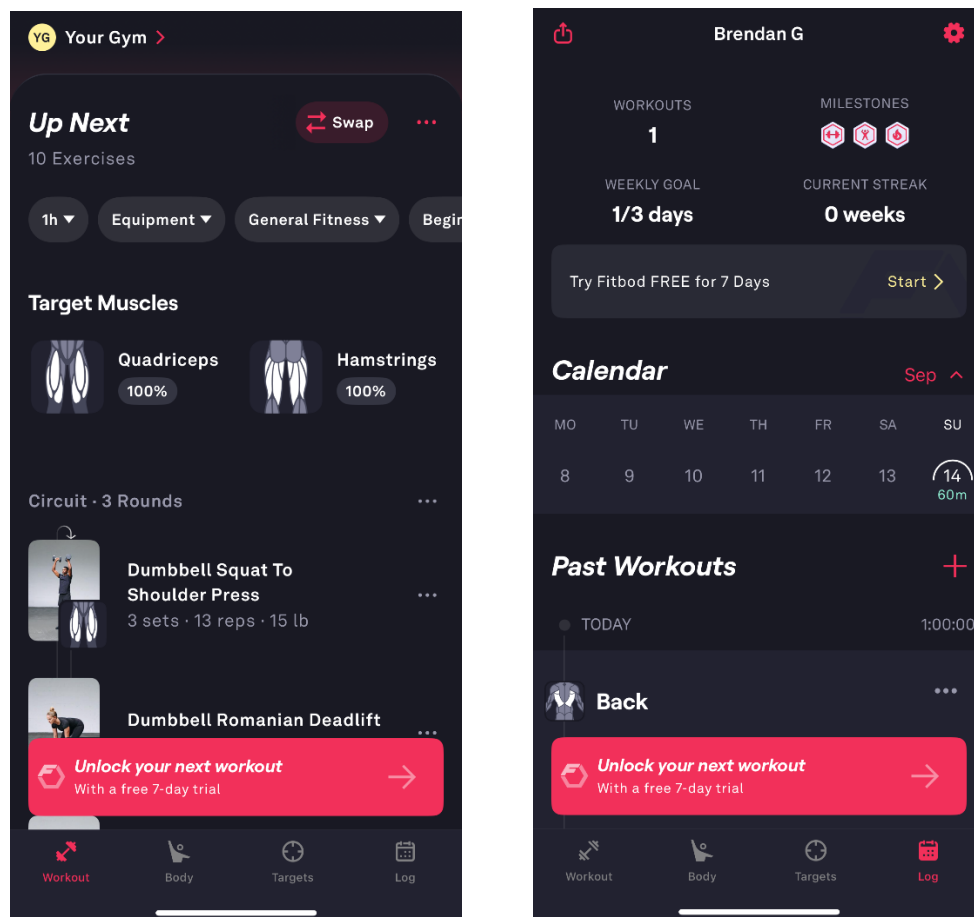


Figure 2.2 Fitbod Application

Fitbod Application is designed to help users create a unique and personalized workout program based on the goals and equipment of the users and their fitness level. With AI, different routines are adaptable and dynamically adjusted on a case-by-case basis, including current performance, muscle recovery, and muscle usage, to avoid excess training and achieve maximum gains. Additionally, this app provides exercise guidance, tracking and connection to wearable devices which may be a comprehensive tool for strength training and overall fitness development [3].

2.1.2.1 Strengths and Weaknesses of Fitbod

Strengths

1. Personalized and Adaptive Workout Plans

- This application is supported by AI to provide customized training plan based on the users' goals, the fitness of the user and the availability of fitness equipment. This makes the plan runs more relevant and effective.

2. Intelligent Adjustment and Recovery Monitoring

- The application will automatically program the exercises depending on muscle restoration, earlier performance, and work history. This will aid to avoid overtraining and will encourage muscle development.

3. Fitness Guide and Workout Archives

- Fitbod provides comprehensive fitness tutorials, both video tutorials and form guide, which is why it is appropriate not only to those who are new to fitness but also to experienced users.

4. Great Integration with Wearable Devices and Applications

- It can integrate well with some popular fitness trackers applications such as Apple Watch, Fitbit, Garmin Watch and others, these applications can synchronize the data time to time to monitor performance better.

5. Provide User-Friendly Interface and Visual Progress Tracking

- The progressive visualization of the design and the ability to visualize the progress encourage users to be consistent and track the progress on the strength and endurance.

Weaknesses

1. Limited Free Features

- The paid version has many important features like unlimited creation of workouts and advanced analytics, which restrict the usage of the free plan.

2. Lack of Good Fitness Tracker

- This application will side more on strength training which more suit for heavy weight trainers and it does not provide nutrition, cardio and some others tracking features.

3. Too much rely on AI recommendations

- Although the AI suggests individualized plans, there are cases when it can recommend workouts that are not quite compatible with the individual preferences or physical constraints of a user.

4. Reduced Community and Social Characteristics

- The app does not have social or community interaction features, and this could lower motivation when the user likes to work in a group or receive progress feedback.

5. Manually Requires Equipment set up

- The existing equipment in a gym should be manually inputted by users, which is not convenient and time-consuming in the early stages of installation.

2.1.3 Fitbit

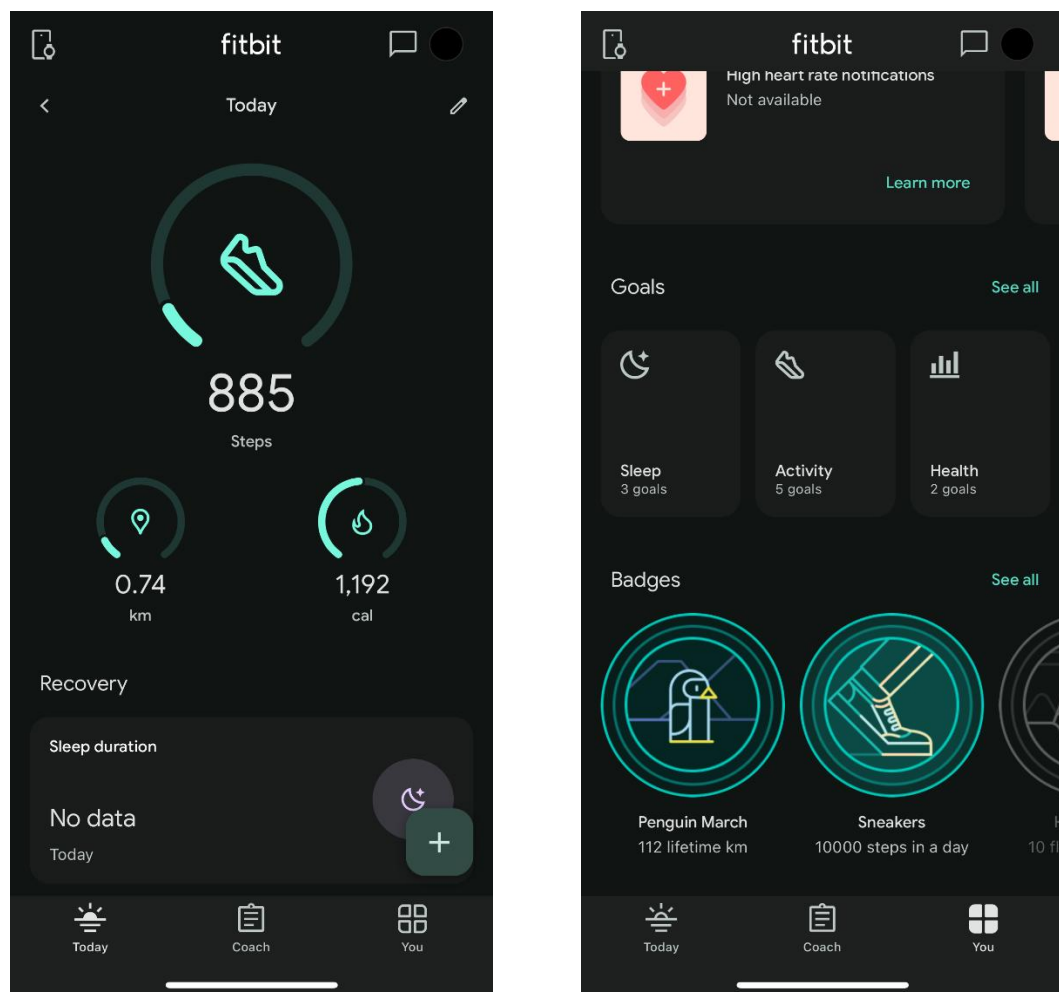


Figure 2.3 Fitbit Application

Fitbit allow user to pair with a wearable device to track daily steps, heartbeat rate, sleeping pattern and calories burned. It will show the real time insight of individualized health data and progress that can help to make healthier lifestyle advice. The application also has such functions as goal setting, reminders to be active, and social challenges, which makes it appropriate to keep your health under constant control and stimulation. The application also has such functions as goal setting, reminders to be active, and social challenges, which makes it appropriate to keep your health under constant control and stimulation [2].

2.1.3.1 Strengths and Weaknesses of Fitbit

Strengths

1. Extensive Monitoring of Health and Activities.

- Fitbit is also an effective health tracker since it tracks some of the most important health indicators such as steps, heart rate, sleep and calories burned that give individuals a comprehensive picture of their current health position.

2. Live Insights and Custom Feedback.

- The app provides real time information and individualized health details that enable the application users to make informed choices to enhance their physical activities and lifestyle practices.

3. Allow Goal Setting and Provide Motivation

- Fitbit allows users to customize their goal, reminders, achievements badges and social challenges to motivate user and determined to stick to healthy habits.

4. Great Integration with Wearable Devices

- It integrates with the product line of wearables and other third-party fitness platforms of Fitbit, managing successful and uninterrupted data exchange.

5. User-Friendly Interface and Visualization of Data

- Fitbit provides an easy navigation interface with visualized graphs and summaries of your health or fitness records that may help user to understand their progress easily.

Weaknesses

1. Dependence on Wearable Devices

- Several features are available only with a Fitbit wearable and restrict the functionality of the app.

2. Limited Features for the Free Version of Fitbit

- There are only some features open for free users, for the advanced features including advanced sleep insights and stress management need extra subscription to unlock the features.

3. Data May Not Accurate

- Some measurements such as calorie counts and heart rate readings, can be more or less accurate based on the devices used and the users currently mood.

4. Battery and Connectivity Issues

- The Bluetooth connection of the device with the application may consume the battery power of the device or phone, cause synchronization delays or data may lose easily.

5. Privacy and Data Sharing Concerns

- Like most applications that track personal health, users may be curious on how this application will use and manage their personal health data and shares it with third-party services.

2.1.4 OKOK International

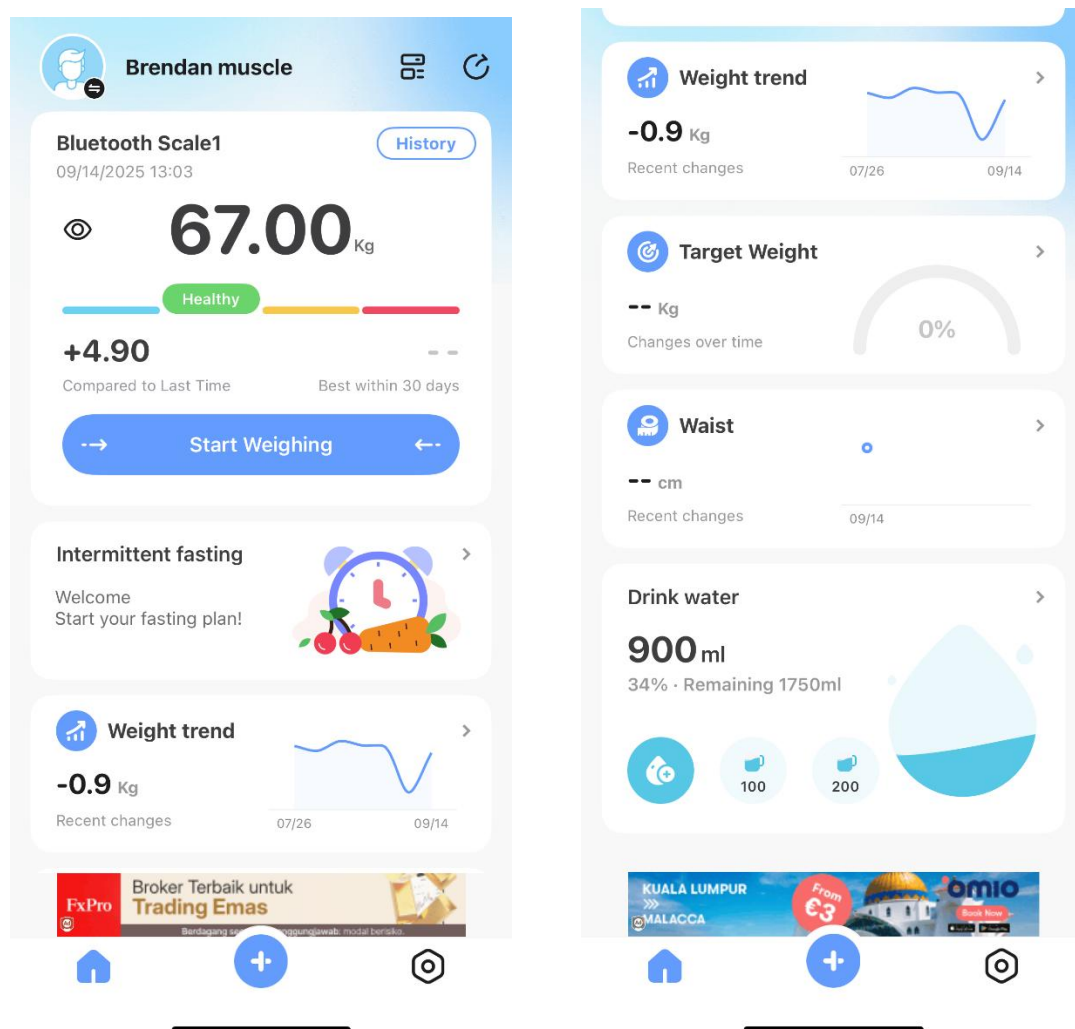


Figure 2.4 OKOK International Application

OKOK International is a health monitoring app that is connected to a smart device such as Bluetooth weight scales to monitor body composition and fitness information. It helps to log some health information such as BMI, weight, body fat percentage, muscle mass and hydration levels. With this information, it can provide clear charts and reports which allow user to track their progress over the course of time and more effectively cope with their wellness objectives with the support of the application [4].

2.1.4.1 Strengths and Weaknesses of OKOK International

Strengths

1. Full Body Composition Tracking

- OKOK International includes some aspects of body measurements like weight, BMI, body fat percentage, muscle mass and the level of hydration which provide users with a profound insight into their physical status.

2. Allows Integration with Smart Devices

- The application is also compatible with one-third party devices that are Bluetooth enabled such as smart weighing scales, which can be used to synchronize data automatically and accurately with ease and efficiency.

3. Monitoring Progress and Data Visualization

- It also shows data in transparent charts and visual reports, which can be easily seen by the user to monitor their health trends and progress over time, which promotes the management of fitness and wellness in the long term.

4. It Provides User-Friendly Interface

- The interface is easy and straight forward thus can be used by users with dissimilar ages and technological background.

5. Personal Wellness Support

- The application will help the users make more frequent upkeep and extensive metrics that will motivate them to remain regular and conscious of their health condition to adopt improved self-management practices.

Weaknesses

1. Restricted Health Measures and Characteristics.

- Although the app is effective to monitor body composition, it does not have more comprehensive functions for meeting health needs, including nutrition tracking, activity tracker or heart rate monitoring, which can make the application less effective as a universal health management tool.

2. Relying on Compatible Hardware

- The application will have a strong dependency on the smart devices that are compatible with OKOK, this implies that the user whose scale is not compatible or whose hardware is not compatible will not use the application fully.

3. Data Accuracy Concerns

- Examples of such measurements as body fat percentage and muscle mass are based on bioelectrical impedance analysis (BIA) that is not always accurate or consistent. Lack of Integration with the rest of the fitness platforms.

4. Lack of Integration with other fitness platforms.

- Unlike more developed fitness apps, cross-platform data sharing is limited through a lack of compatibility with such popular health ecosystems as Google Fit or Apple Health, which limits the popularity of OKOK.

2.2 Comparison between the Existing system and Proposed system

Table 2.1 Comparison between the existing and proposed application

Features/ Criteria	MyFitnessPal	Fitbod	Fitbit	OKOK International	Proposed System
Free in charge	✓	✗	✓	✓	✓
User-friendly for elderly	✗	✗	✗	✗	✓
User authentication	✓	✓	✓	✓	✓
Exercise guidance	✓ (basic)	✓ (AI Workout)	✓	✗	✓ (Senior-safe guided videos)
Nutrition / meal tracking	✓	✗	✓	✗	✓
Medication reminder	✗	✗	✗	✗	✓
Water intake tracking	✓	✗	✓	✗	✓
Sleep tracking	✗	✗	✓	✗	✓
Emergency SOS	✗	✗	✗	✗	✓
Voice Recording	✗	✗	✗	✗	✓

Chapter 3

System Methodology/Approach

3.1 System Methodology

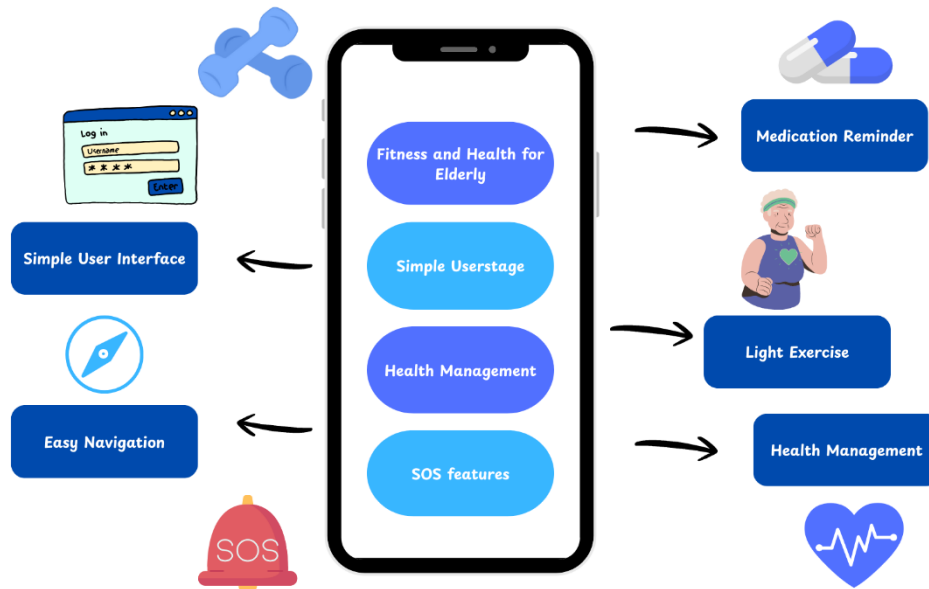


Figure 3.1 User-Centered Design (UCD)

The development of the Fitness and Health Application of Elderly is based on the User-Centered Design (UCD) with the emphasis on simplicity, clarity and accessibility with the help of which older users can manage their daily well-being. The interface has been created in a simple structure and large, understandable features such that the user does not have to spend much time navigating between the major features of medication reminders, light exercises and health management tools. The app encourages cognitive load minimization by focusing on simple and easy user interface and easy navigation to enable elderly users to confidently operate the system without misunderstanding its operation. All features are designed to meet specific requirements, medication reminders are used to ensure consistency in taking medication, light exercise modules are used to ensure safe physical activity and health management functions are used to record the necessary information like meal, hydration and sleep that users need to record daily. SOS feature also boosts the safety because emergency assistance can be accessed at any time. This user-centered approach guarantees the design so that all the functions serve the daily activities of the elderly individuals, increase their self-reliance and promote well-being in general but offers in an intuitive and user-friendly way.

3.2 System Design Diagram/ Equation

3.2.1 System Architecture Diagram

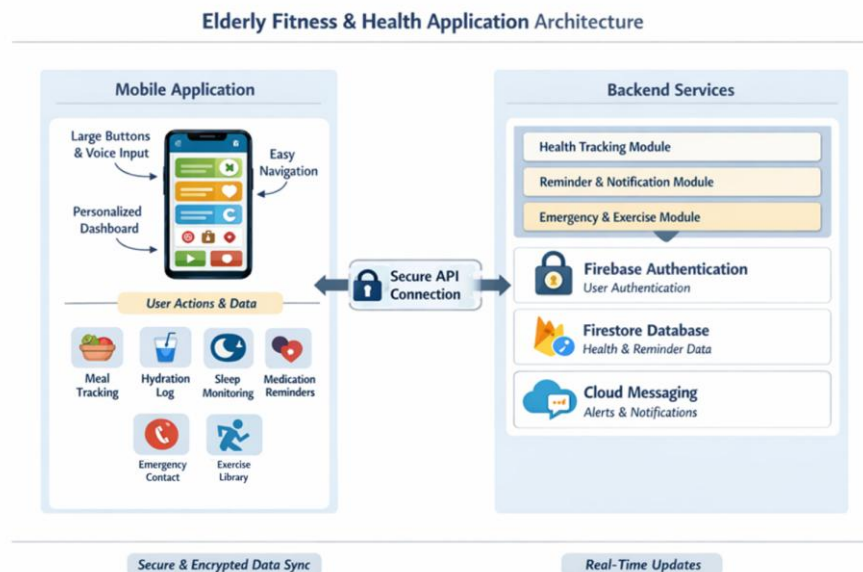


Figure 3.2 System Architecture Diagram

The Fitness and Health Application for elderly is created to create an easy, friendly and convenient health management experience for the elderly. Its software design has been designed such that there is a fluent interaction between the mobile application interface and the underlying back-end services. The essential characteristics of the application are health tracking for meals, hydration, sleep, medication reminders, library of exercises, emergency contact support and a personalized dashboard showing daily summaries. The mobile interface sends user actions to secure backend processes that authenticate, save and retrieve vital data to ensure that the user experience is consistent and reliable.

The mobile application is designed to offer an intuitive layout that has big buttons, large font, voice to text input, easy navigation and clear instructions to be followed by the elderly user at the frontend. The system is connected to the backend, which is Firebase, the system communicates with the backend via secure API calls to authenticate users, store data and update in real time. The authentication of users also means that every user can log in safely and manage their personal health information. After the authentication process, users are allowed to write their daily meals, add water intake, sleep hours, go through exercise tutorials and have

reminders of their medication. All the logs and updates are immediately synchronized with the backend database to provide accuracy and consistency between the different sessions.

The backend architecture is such that it is configured to accommodate modularity, thus every functional component including health tracking, reminder, emergency and exercise modules can be functional and yet connected effectively with the main database. Firebase Authentication is used to provide secure authentication and account recovery and Firebase is used to store health records of the user, schedule of reminders and exercise information. The management of notifications is performed with a cloud messaging service to create timely notifications with medication reminders or hydration prompts.

In general, architecture focuses on reliability, simplicity and accessibility. Instant information synchronization keeps the users updated on their health status all the time. Privacy and sensitive health data of the users is secured by means of secure authentication and encrypted database communication. Modular structure is also used to make the app easy to update, expand or maintain without interfering with the user experience. The system architecture provides a reliable digital space which promotes healthy habits and daily living of the elderly by integrating technical stability and an aged-friendly interface.

3.2.2 Use Case Diagram and Description

3.2.2.1 Use Case Diagram of Fitness and Health Application for Elderly

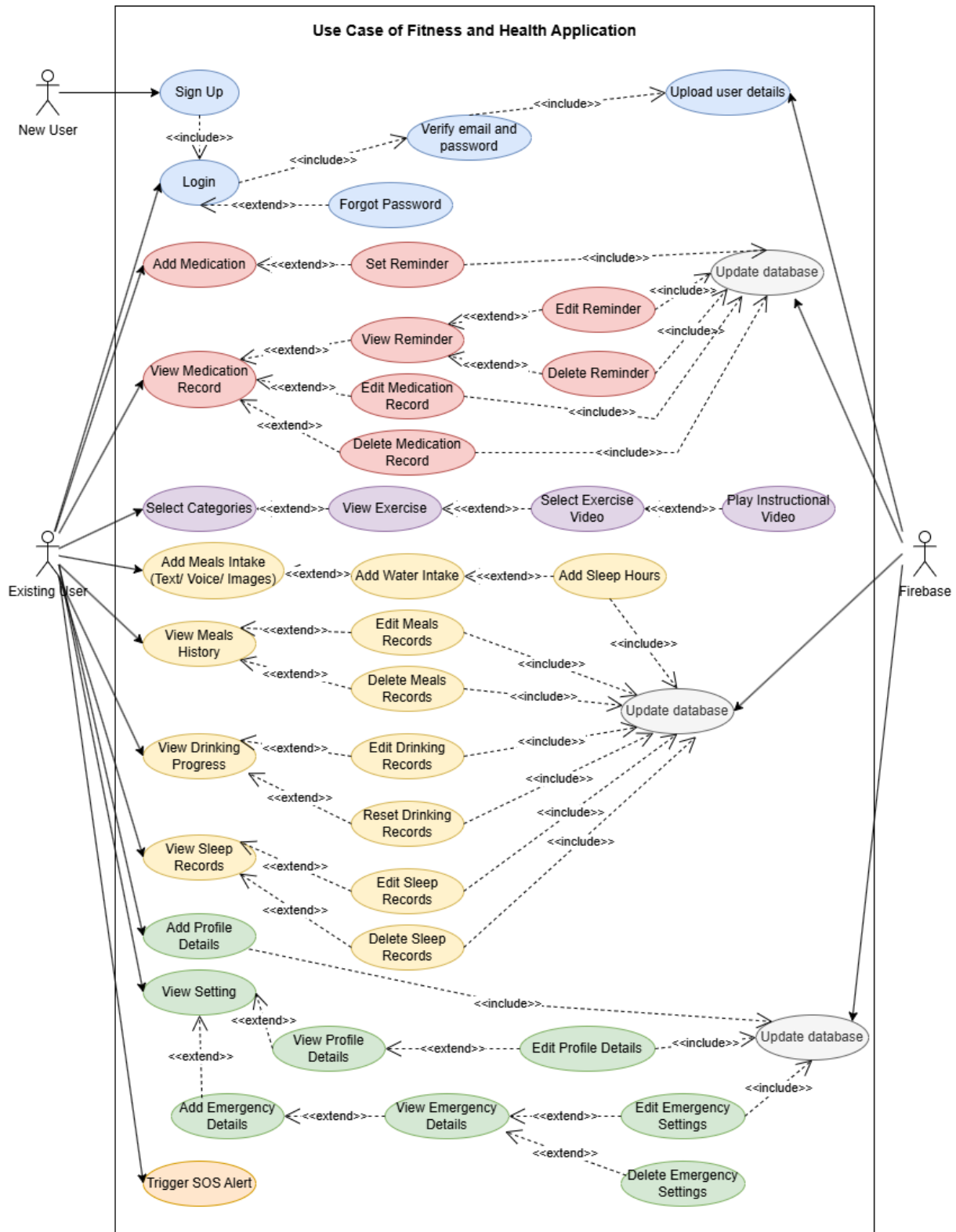


Figure 3.3 Use Case Diagram of Fitness and Health Application for Elderly

3.2.2.2 Account Register Module – Use Case Description

Table 3.1 Use Case Description (Register Module)

Use Case Name: New User	ID: 1	Importance Level: High
Primary Actor: New User		Use Case Type: Detail, Essential
Stakeholders and Interests: • New User – Able to register or sign up a new account		
Brief Description: The use case describes the process of registration of a new account for new user		
Trigger: New users can register or sign up for a new account for the to do list application		
Type: External		
Relationships: Association: New User Include: Log in Extend: Generalization:		
Normal Flow of Events: 1. New User enters Fitness and Health Application for Elderly. 2. New User clicks the “SIGN UP” keyword to register their account. 3. New User enters their information such as username, email, password and confirm password. 4. New User submits the registration request by clicking the “Register” button. 5. System validate user does not exist in the database.		

6. System checks the validation of user's email and password. 7. System saves information of new users. 8. System toasts a message "Account created successfully!" to new user.
Sub Flows: Not applicable
Alternate / Exceptional Flows: 5a. The system will display message "Account already exists with this email" and terminated session. 6a. The system will display error message when the user does not follow the format of email address and password.

3.2.2.3 Login Module – Use Case Description

Table 3.2 Use Case Description (Login Module)

Use Case Name: Existing User	ID: 2	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to login into the application		
Brief Description: The use case describes the process of signing in to their registered account in the application for existing user		
Trigger: Existing User wants to perform fitness and health features using CRUD function. Type: External.		
Relationships: Association: Existing User Include: Add Medication, View Medication Records, Select Categories, Add Meals Intake, View Meals History, View Drinking Progress, View Sleep Records, Add Profile Details, View Setting, Trigger SOS Alert. Extend: Set Reminder, View Reminder, Edit Reminder, Delete Reminder, Edit Medication Record, Delete Medication Record, View Exercise, Select Exercise Video, Add Water Intake, Add Sleep Hours, Edit Meals Records, Delete Meals Record, Edit Drinking Record, Reset Drinking Record, Edit Sleep Records, Delete Sleep Records, View Profile Details, Edit Profile Details, Add Emergency Details, View Emergency Details, Edit Emergency Settings, Delete Emergency Settings. Generalization:		
Normal Flow of Events: - Existing User enters their email and password. - Existing User press on the “LOGIN” button. - System validate user does not exist in the database. - System checks the validation of user’s email and password. - System toasts a message “Login successfully!” and go to home screen.		
Sub Flows: Not applicable		
Alternate / Exceptional Flows:		

- 3a. The system will display message “Please enter email and password”.
- 4a. The system will display error messages when the email and password is invalid.

3.2.2.4 Add New Medication Module – Use Case Description

Table 3.3 Use Case Description (Add New Medication Module)

Use Case Name: Existing User	ID: 3	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to add new medication record and set reminder in the application		
Brief Description: The use case describes the process of add new medication record and set reminder to their registered account in the application.		
Trigger: Existing User can create their medication record using add new medication function and set reminder for every record with set reminder function. Type: Internal		
Relationships: Association: Existing User Include: Extend: Set Reminder Generalization:		
Normal Flow of Events: - Existing User presses the “Add Medication” button. - Existing User fills the Medication Name. - Existing User selects the Dosage of medication. - Existing User can set reminder for the medication. - Existing User is optional to select the repeated frequency of reminder. - Existing User is optional to include the image of medicine. - Existing User clicks “Save Medication” button to add new medication.		
Sub Flows: 5a. Existing User set the reminder by selecting time in 24 Hours format. 5b. Existing User can enable or disable the reminder.		
Alternate / Exceptional Flows: 6a. Existing User save the medication record to database. 6b. The system will display message “Medication saved successfully!”		

3.2.2.5 View, Edit, Delete Medication Module – Use Case Description

Table 3.4 Use Case Description (View, Edit, Delete Medication Module)

Use Case Name: Existing User	ID: 4	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to view, edit and delete the list of Medication and the reminders of medication in the application		
Brief Description: The use case describes the process of view, edit, delete medication records and their reminders in the application for existing user		
Trigger: Existing User can view their created medication records and related reminders in medication page. Then, they can choose to edit, delete or just view the medication records and related reminders.		
Type: Internal		
Relationships: Association: Existing User Include: Extend: View Reminder, Edit Medication, Delete Medication, Edit Reminder, Delete Reminder Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to medication page. - The list of added medication records includes the medication reminders that will be displayed on the medication page in the application. - Existing User can toggle the reminder button to turn reminder on or off. - Existing User can click on the edit icon to update the medication record or reminder if any corrections are needed. - Existing User can click on the delete icon to remove the medication record and reminder if it is no longer needed or misadded. - Existing User can mark a medication as “Done” once it has been taken.		
Sub Flows: Not applicable		
Alternate / Exceptional Flows:		

- 5a. The system displays success messages “Medication Saved Successfully!” after user saved the updated records.
- 6a. The system displays message to ask user, “Are you sure you want to delete {medication name}?”.
- 6b. The system displays success messages “Deleted Successfully!” after user deleted any records.

3.2.2.6 View Exercise Lists Module – Use Case Description

Table 3.5 Use Case Description (View Exercise Lists Module)

Use Case Name: Existing User	ID: 5	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to view the list of Exercise Library in the application		
Brief Description: This use case describes the process of viewing different exercises categorized by type and difficulty.		
Trigger: Existing User can view exercise library in exercise lists page. Type: Internal		
Relationships: Association: Existing User Include: Extend: Select Exercise Video Generalization:		
Normal Flow of Events: - Existing User login to their account. - The list of exercises will be shown on the exercise lists page and categorize with type of exercise. - Existing User can select categories of the exercise. - Existing User can select any interested exercise video and start to follow the video exercise. - Existing User can press “Done” after they have completed the exercise, a completed badge will be appeared at the relevant exercise.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows: -		

3.2.2.7 Add Health Log Module – Use Case Description

Table 3.6 Use Case Description (Add Health Log Module)

Use Case Name: Existing User	ID: 6	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to add health log in the application		
Brief Description: The use case describes the process of add daily health log to their registered account in the application for existing user		
Trigger: Existing User can create their daily health log using add health log function.		
Type: Internal		
Relationships:		
Association: Existing User		
Include: Add Meals Intake, Add Water Intake, Add Sleep Hours		
Extend:		
Generalization:		
Normal Flow of Events: - Existing User navigates to the Health Log Page. - Existing User enters their daily meal intake by using text or voice recording or input with image. - Existing User toggles “Add Glass” button to record their water drinking progress and toggles “Reset” if wrongly recorded. - Existing User selects the number of hours they slept the previous night. - Existing User clicks “Save Log” button to create new health log, “Delete Record” button to revert the record.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows:		
6a. Existing User saves the health log record to database.		
6b. The system will display message “Health Log saved successfully!”		

3.2.2.8 View, Edit, Delete Health Log Module – Use Case Description

Table 3.7 Use Case Description (View, Edit, Delete Health Log Module)

Use Case Name: Existing User	ID: 7	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to view, edit and delete the list of Health Log in the application		
Brief Description: The use case describes the process of view, edit and delete Health Log in the application for existing user		
Trigger: Existing User can view, edit and delete their created Health Log in home page.		
Type: Internal		
Relationships: Association: Existing User Include: View Meals History, View Drinking Progress, View Sleep Records Extend: Edit Meals Records, Delete Meals Records, Edit Drinking Records, Reset Drinking Records, Edit Sleep Records, Delete Sleep Records Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to Health Log page. - Existing User selects the date to check the previous health log. - The list of added health log records includes the daily meals intake, water drinking progress and sleep hours that will be displayed on the health log page in the application. - Existing User allows to update the health log record if any corrections are needed. - Existing User allows to remove the health log record if it is misadded.		
Sub Flows: Not applicable		
Alternate / Exceptional Flows: 5a. The system displays success messages “Health Log saved successfully!” after user saved the updated records.		

- 6a. The system displays message to ask user, “Delete all meals, water intake, sleep hours and voice notes for this date? This cannot be undone.”.
- 6b. The system displays success messages “Record deleted for selected date” after user deleted any records.

3.2.2.9 Add Profile Details Module – Use Case Description

Table 3.8 Use Case Description (Add Profile Details Module)

Use Case Name: Existing User	ID: 8	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to add their profile details in the application		
Brief Description: The use case describes the process of adding information of user in the application for existing user		
Trigger: Existing User can add their profile information such as username, age, gender, height, weight and health conditions in the application. Type: Internal		
Relationships: Association: Existing User Include: Extend: Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to setting page. - Existing User opens the Profile screen. - Existing User can enter all the personal information as needed. - Existing User clicks “Save” button to add new profile details.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows: 5a. Existing User save the profile details to database. 5b. The system will display message “Profile updated successfully!”		

3.2.2.10 View, Edit Profile Details Module – Use Case Description

Table 3.9 Use Case Description (View, Edit Profile Details Module)

Use Case Name: Existing User	ID: 9	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to view and edit their profile in the application		
Brief Description: The use case describes the process of viewing and editing information of user in the application for existing user		
Trigger: Existing User can view and edit their profile information such as name, age, gender, height, weight and health conditions in the application. Type: Internal		
Relationships: Association: Existing User Include: Extend: Edit Profile Details Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to the setting screen. - Existing User presses on profile to go into Profile Setting screen. - Existing User can change their personal information optionally. - Existing User presses “Save Changes” button to update new profile details if having any changes.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows: 5a. The system will display message “Profile updated successfully!”		

3.2.2.11 Add Emergency Details Module – Use Case Description

Table 3.10 Use Case Description (Add Emergency Details Module)

Use Case Name: Existing User	ID: 10	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to add emergency details in the application		
Brief Description: The use case describes the process of adding information of emergency contact in the application for existing user		
Trigger: Existing User can add emergency details such as their name, contact number and relationship.		
Type: Internal		
Relationships:		
Association: Existing User		
Include:		
Extend:		
Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to setting page. - Existing User opens the Emergency Contact screen. - Existing User can enter all the emergency contact information as needed. - Existing User clicks “Save” button to add new emergency details.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows:		
5a. Existing User saves the emergency details to database.		
5b. The system will display message “Emergency contact has been added”		

3.2.2.12 View, Edit, Delete Emergency Details Module – Use Case Description

Table 3.11 Use Case Description (View, Edit, Delete Emergency Details Module)

Use Case Name: Existing User	ID: 11	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to view and edit emergency details in the application		
Brief Description: The use case describes the process of viewing and editing information of emergency contact in the application for existing user		
Trigger: Existing User can view and edit emergency contact information such as name, contact number and relationship in the application.		
Type: Internal		
Relationships:		
Association: Existing User		
Include:		
Extend: Edit Emergency Settings, Delete Emergency Settings		
Generalization:		
Normal Flow of Events: - Existing User login to their account. - Existing User navigates to setting page. - Existing User opens the Emergency Contact screen. - Existing User can press on the edit icon to update the emergency contact details if any corrections are needed, then press “Update Contact” to update the record. - Existing User can press on the delete icon to remove the emergency contact record if it is no longer active or misadded.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows:		
4a. The system displays success messages “Emergency contact has been updated” after user saved the updated records.		
5a. The system displays message to ask user, “Delete {Emergency Contact Name}?”.		

3.2.2.13 SOS Module – Use Case Description

Table 3.12 Use Case Description (View Emergency Details Module)

Use Case Name: Existing User	ID: 12	Importance Level: High
Primary Actor: Existing User	Use Case Type: Detail, Essential	
Stakeholders and Interests: Existing User – Able to Trigger SOS Alert		
Brief Description: The use case describes the process of triggering SOS alert by clicking SOS button		
Trigger: Existing User can make emergency calls to 999 or saved emergency contact.		
Type: Internal		
Relationships: Association: Existing User Include: Extend: Generalization:		
Normal Flow of Events: - Existing user login in the application - Existing user clicks SOS button shows in the middle of bottom navigation bar in home page. - Existing users choose to call 999 or any saved emergency contact.		
Sub Flows: Not Applicable		
Alternate / Exceptional Flows: -		

3.2.3 Activity Diagram

3.2.3.1 Account Register Module – Activity Diagram

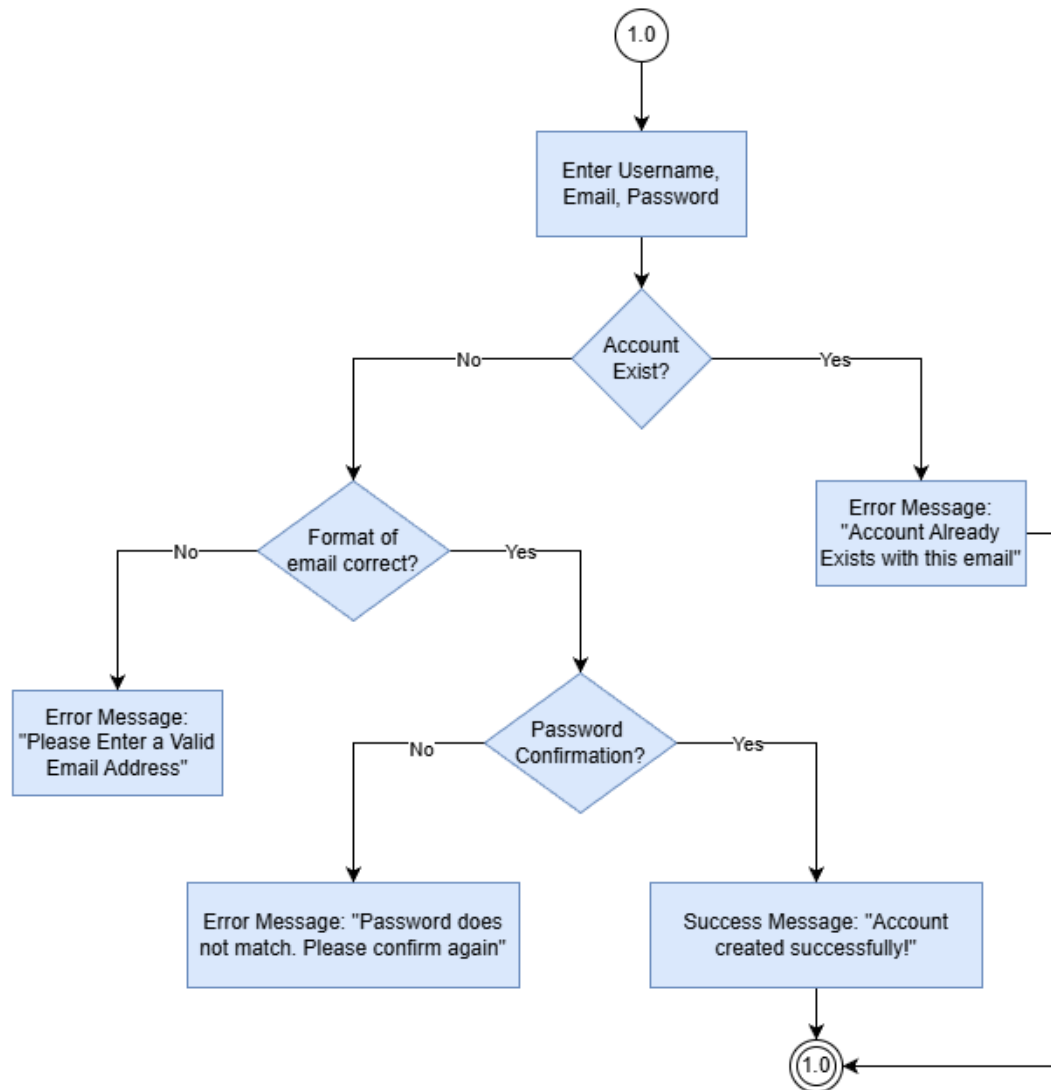


Figure 3.4 Account Register Module – Activity Diagram

3.2.3.2 Login Module – Activity Diagram

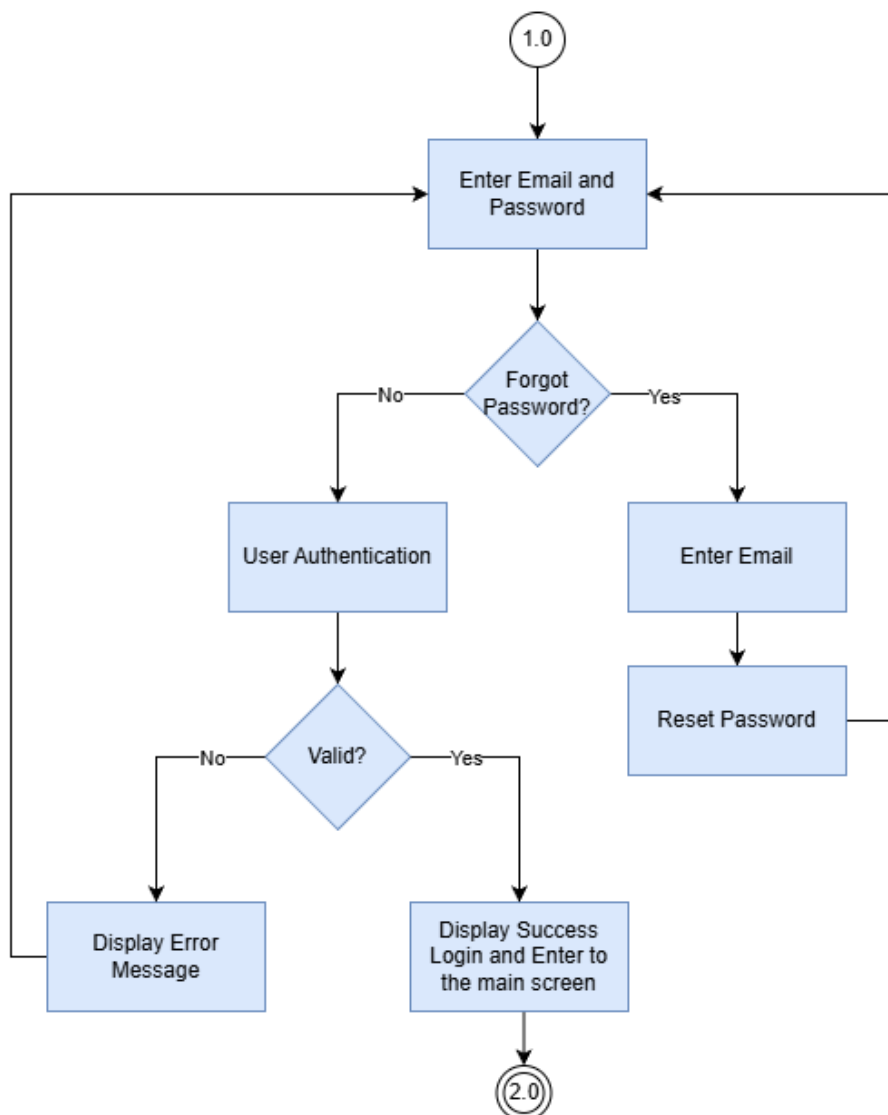


Figure 3.5 Login Module – Activity Diagram

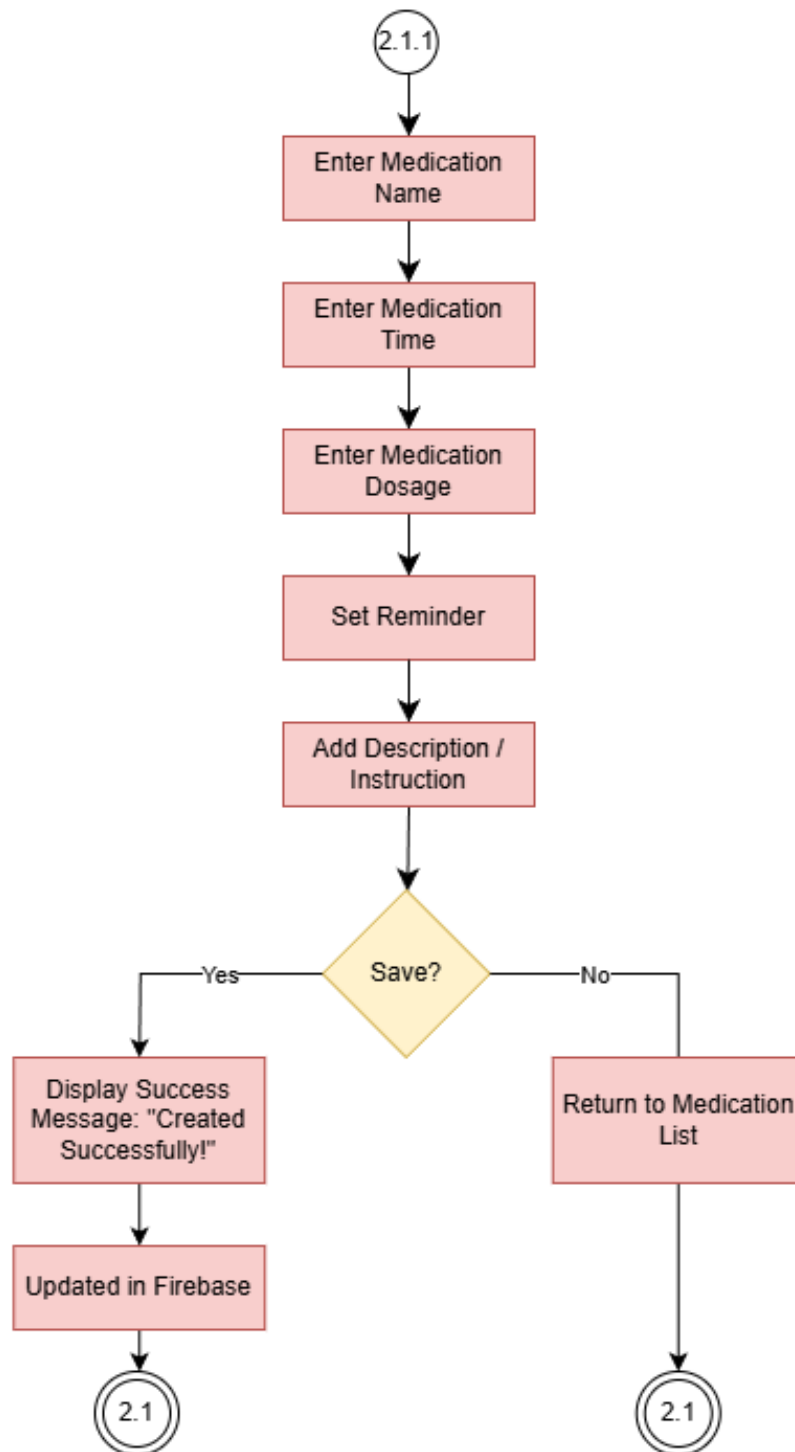
3.2.3.3 Add New Medication Module – Activity Diagram

Figure 3.6 Add New Medication Module – Activity Diagram

3.2.3.4 View, Edit, Delete Medication Module – Activity Diagram

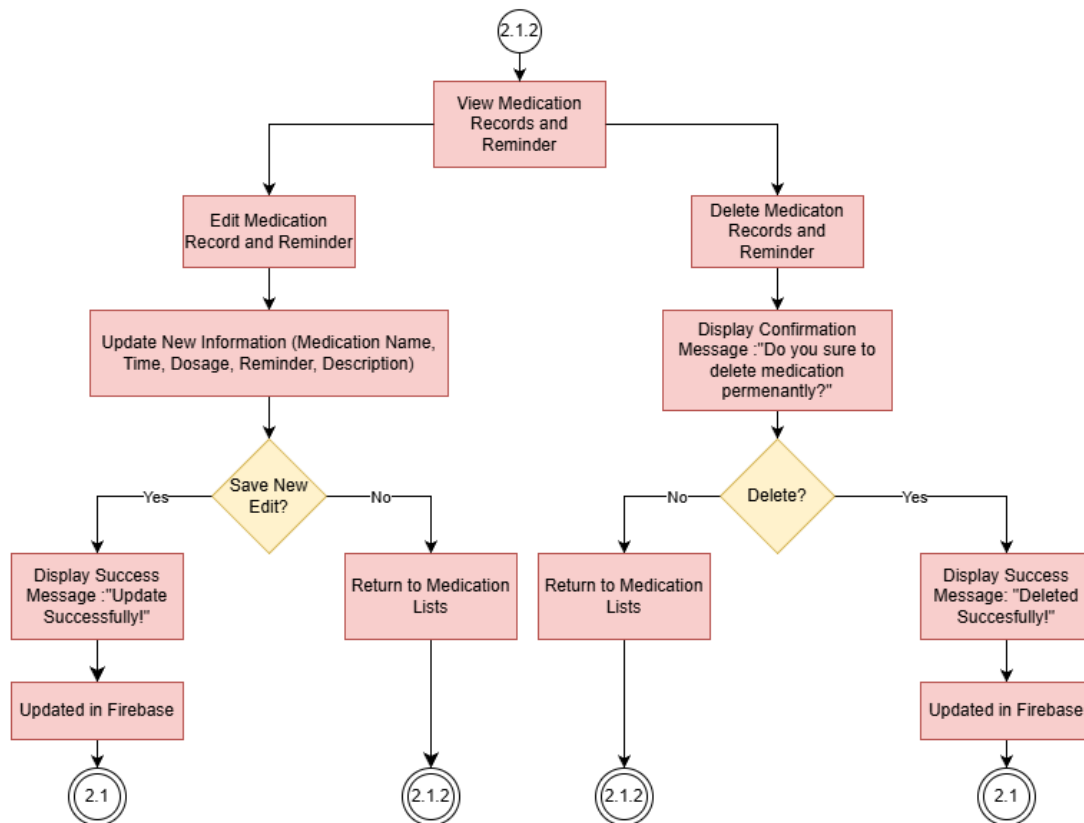


Figure 3.7 View, Edit, Delete Medication Module – Activity Diagram

3.2.3.5 View Exercise Lists Module – Activity Diagram

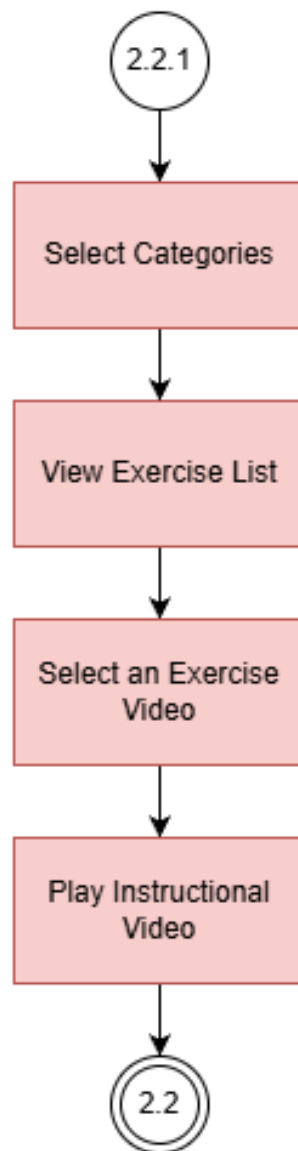


Figure 3.8 View Exercise Lists Module – Activity Diagram

3.2.3.6 Add Health Log Module – Activity Diagram

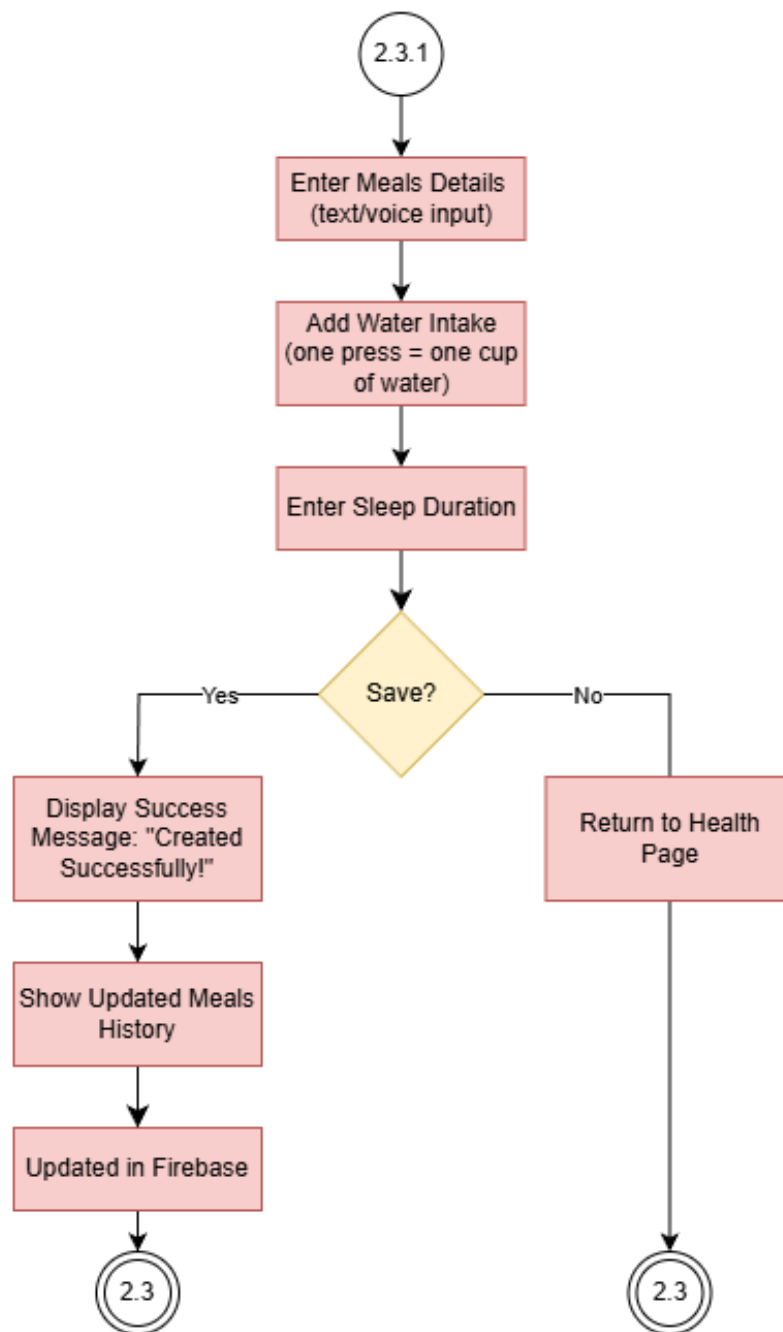


Figure 3.9 Add Health Log Module – Activity Diagram

3.2.3.7 View, Edit, Delete Health Log Module – Activity Diagram

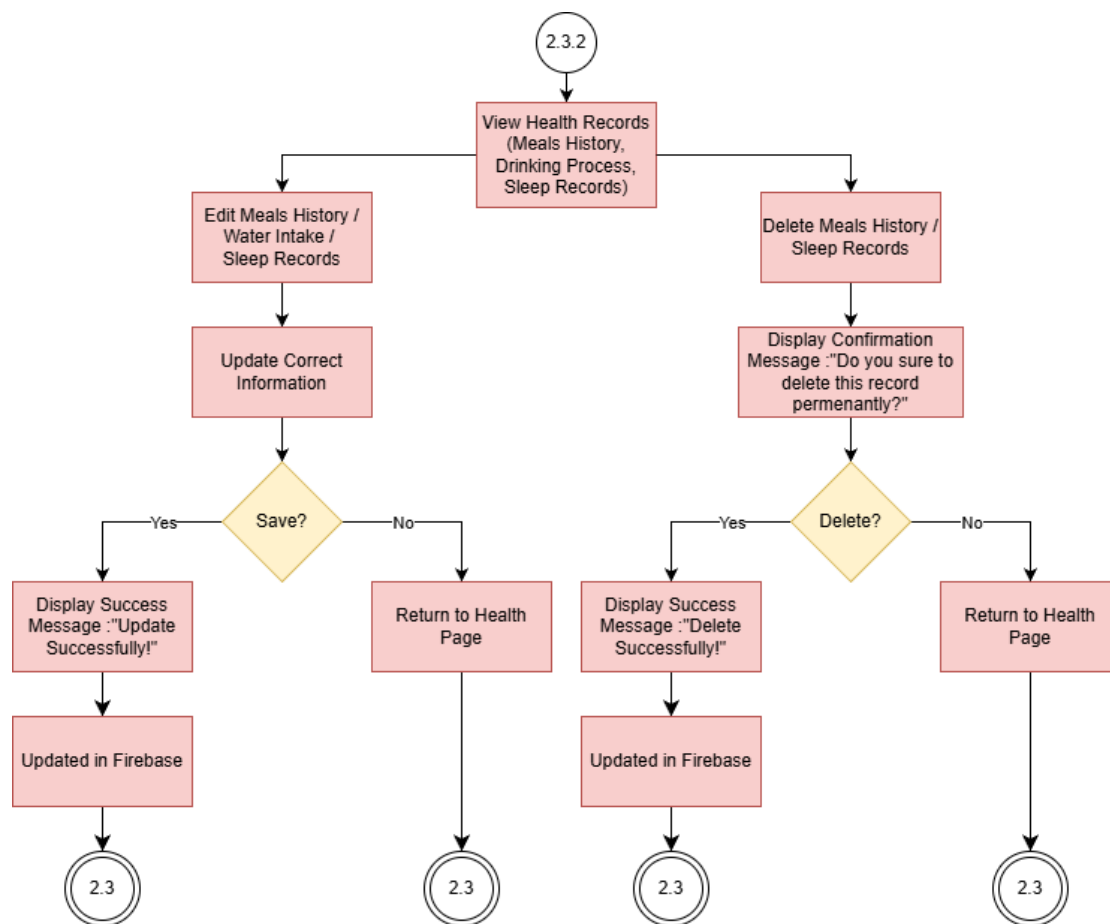


Figure 3.10 View, Edit, Delete Health Log Module – Activity Diagram

3.2.3.8 Add Profile Details Module – Activity Diagram

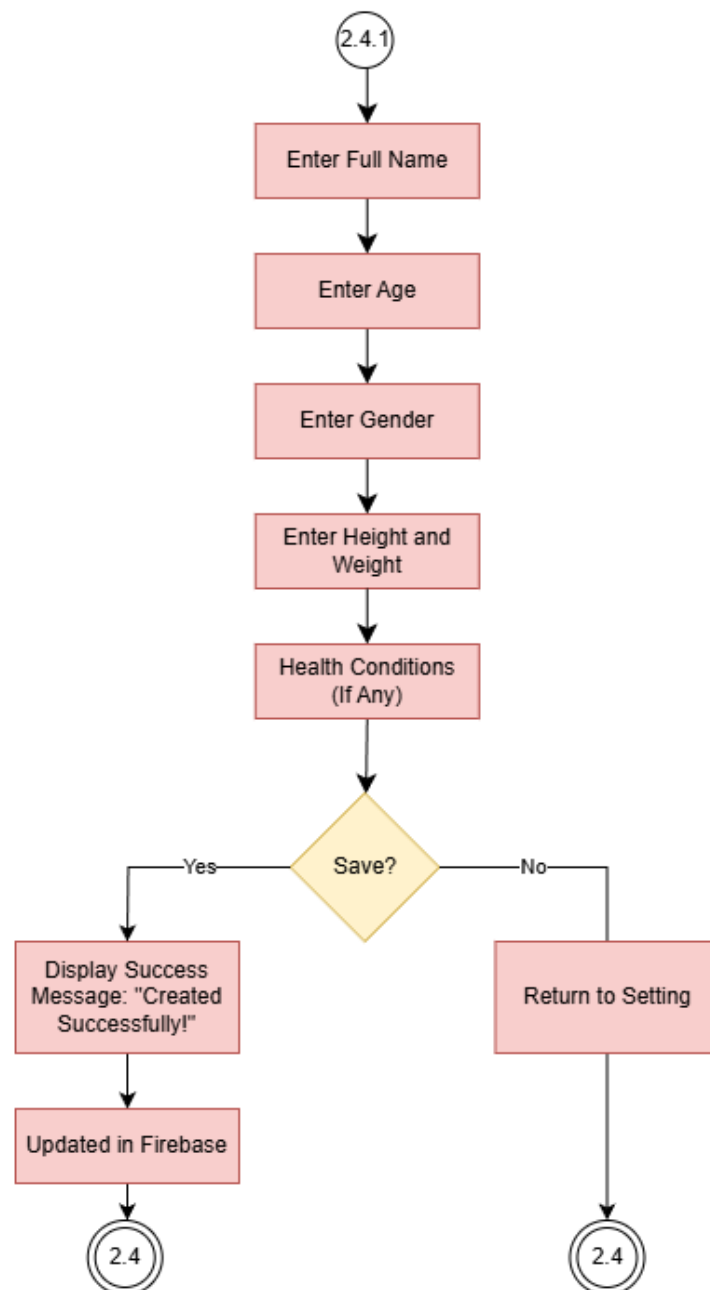


Figure 3.11 Add Profile Details Module – Activity Diagram

3.2.3.9 View, Edit Profile Details Module – Activity Diagram

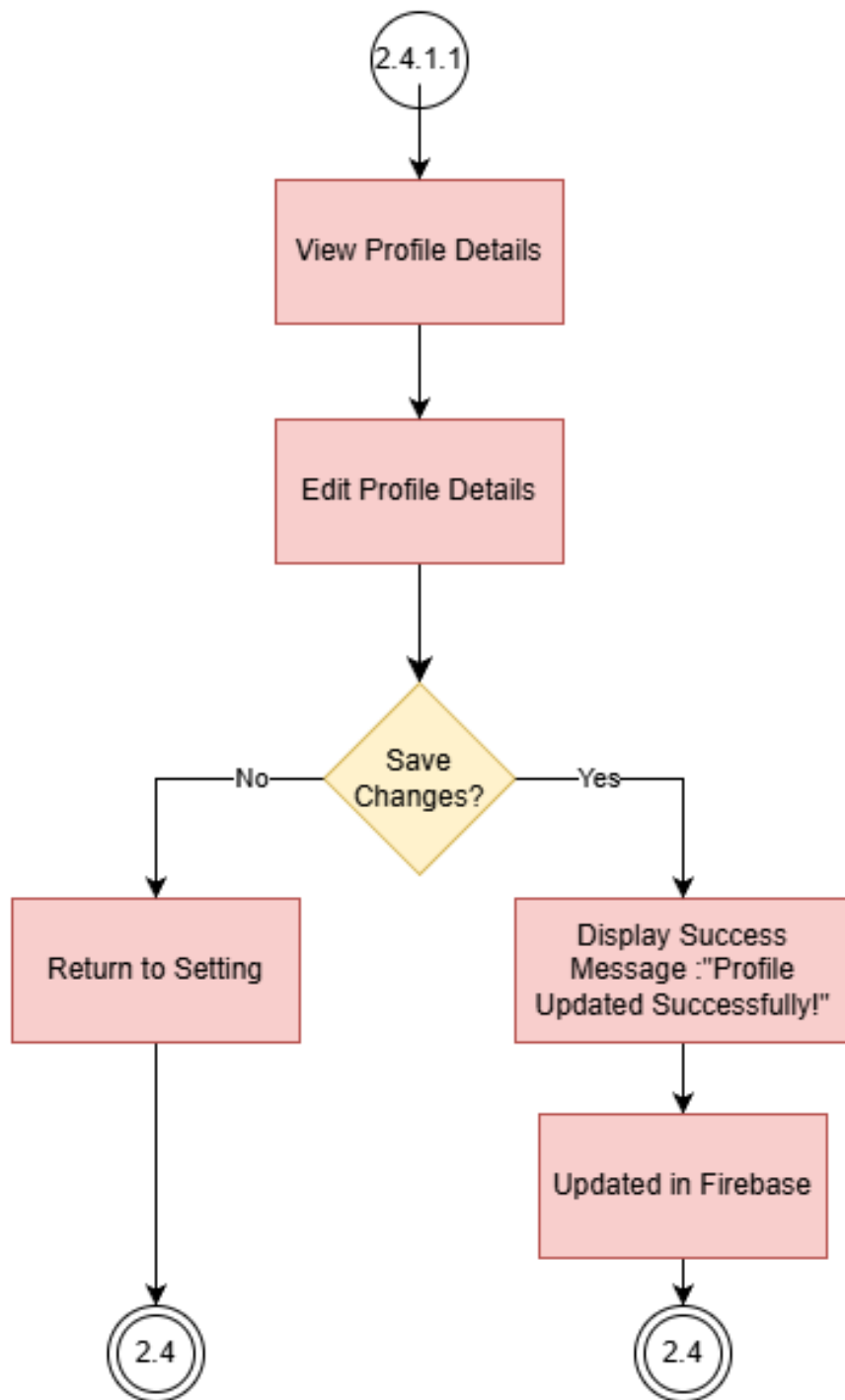


Figure 3.12 View, Edit Profile Details Module – Activity Diagram

3.2.3.10 Add Emergency Details Module – Activity Diagram

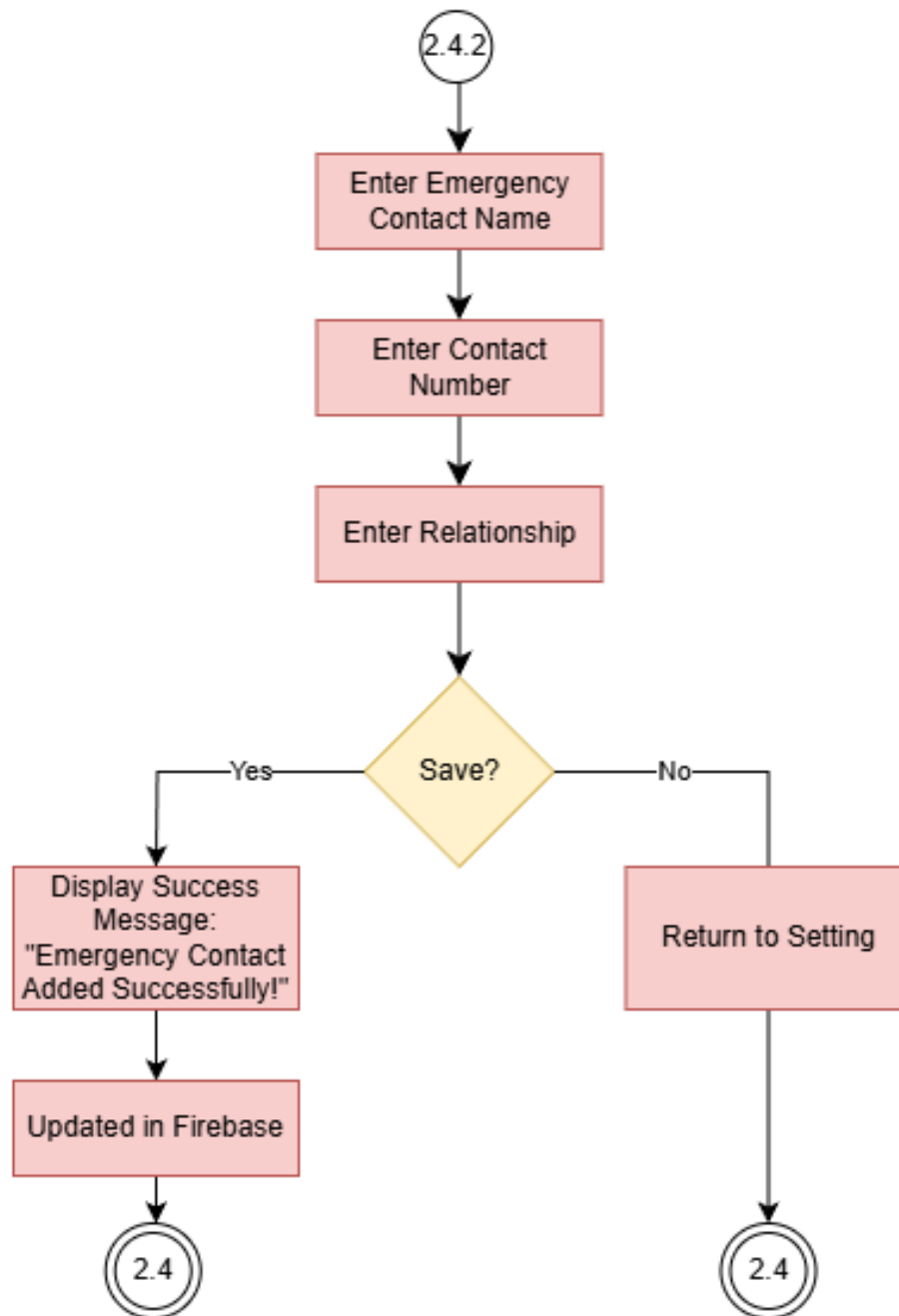


Figure 3.13 Add Emergency Details Module – Activity Diagram

3.2.3.11 View, Edit, Delete Emergency Details Module – Activity Diagram

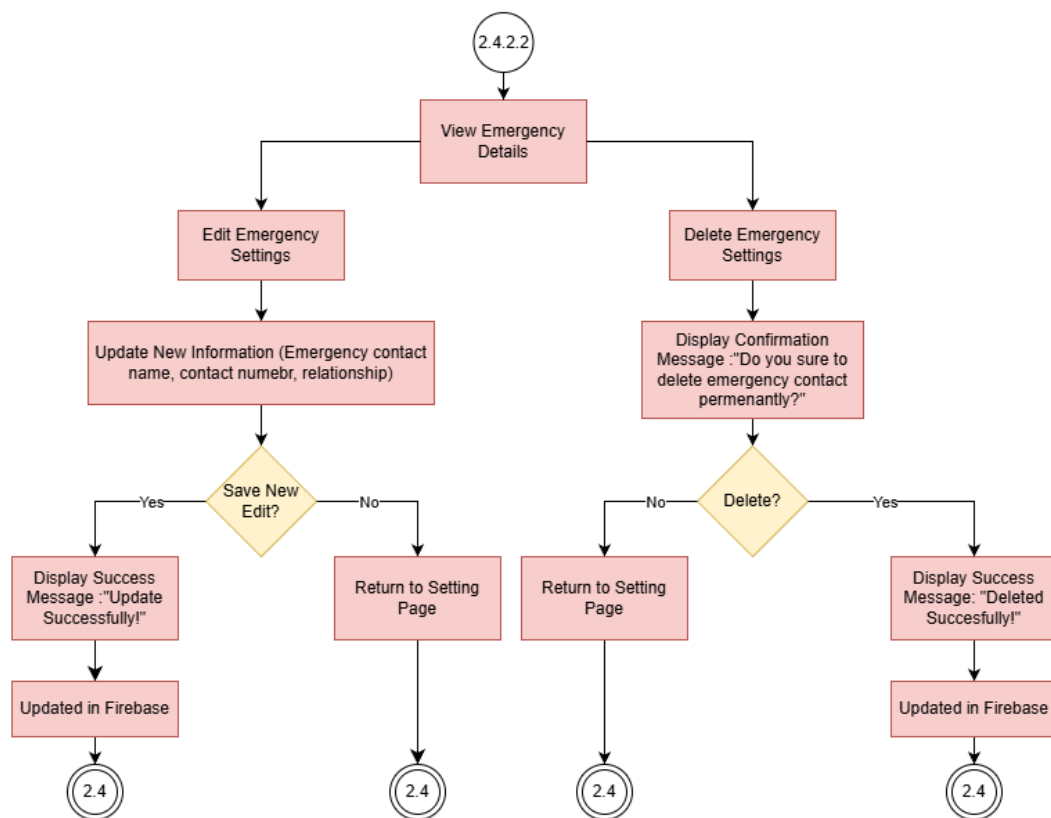


Figure 3.13 View, Edit, Delete Emergency Details Module – Activity Diagram

3.2.3.12 SOS Module – Activity Diagram

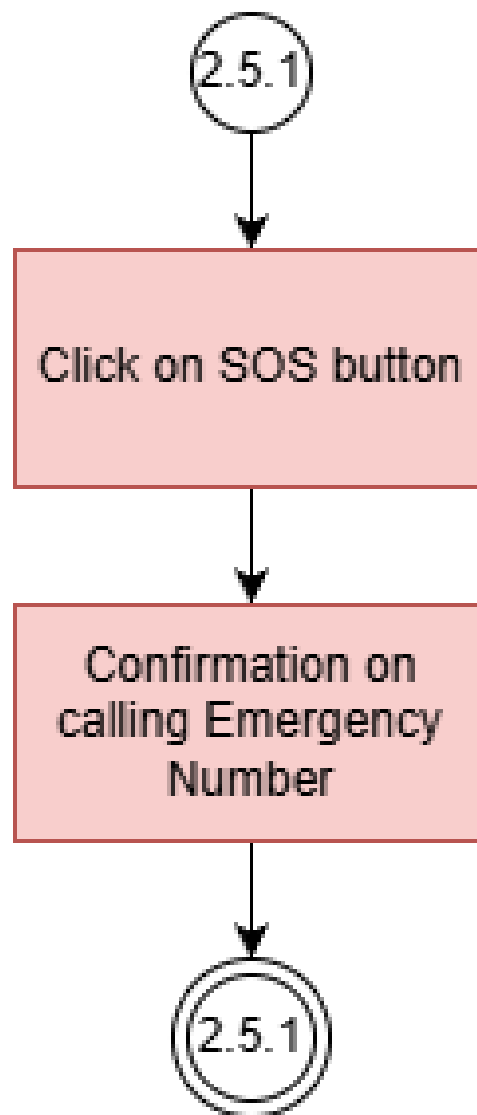


Figure 3.14 SOS Module – Activity Diagram

Chapter 4

System Design

4.1 System Block Diagram

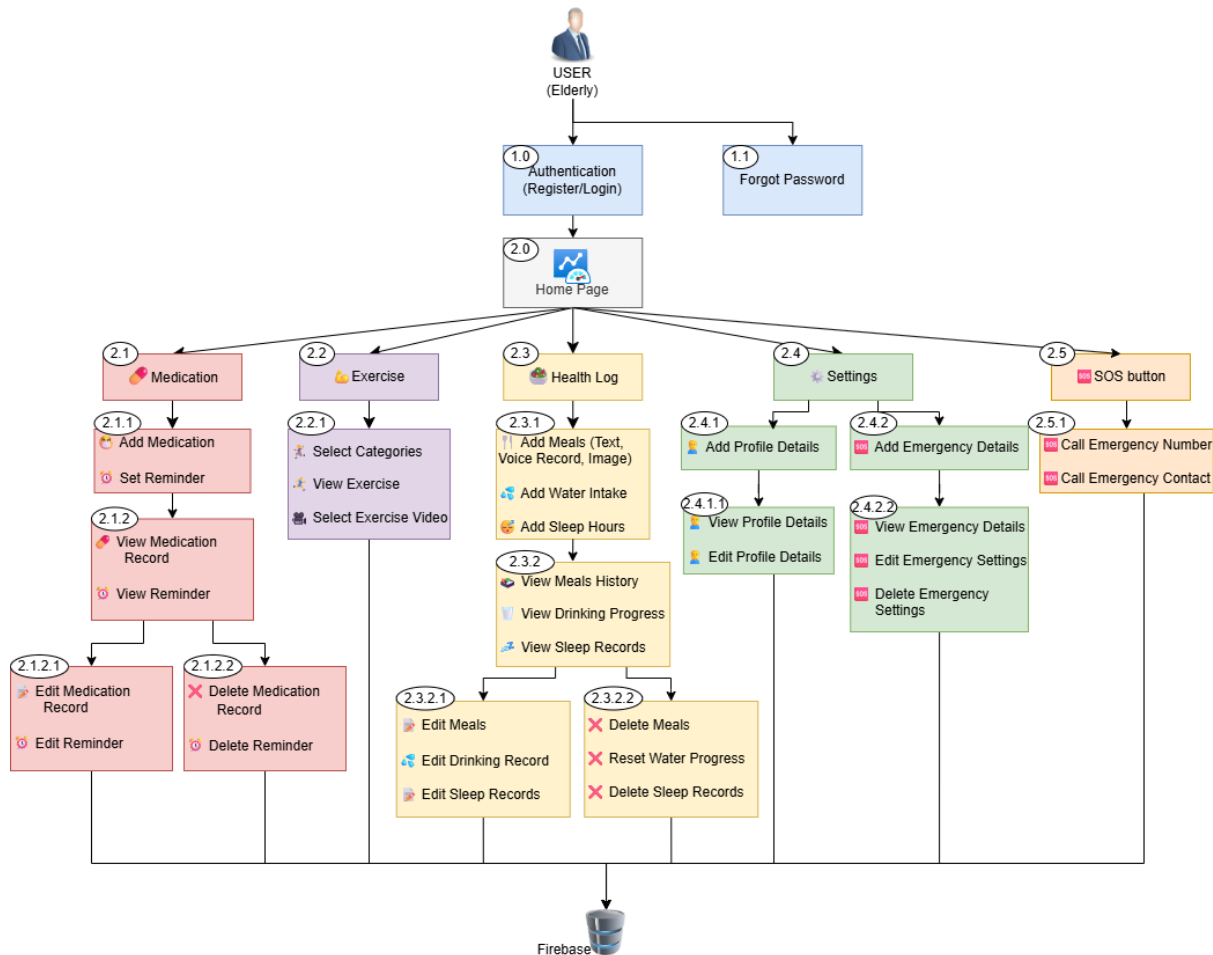


Figure 4.1 Block Diagram of Fitness and Health Application for Elderly

First, the new users need to register or sign up an account before they wish to proceed to login step. Then, the registered user and existing user need to login into the application with their email address and password. Additionally, if the user forgot the password, they may reset their password by clicking the forger password link and reset their password before they log in again.

This Fitness and Health Application for Elderly consist of five main pages with one SOS button. The default page will be the home screen with important medication reminders, daily

CHAPTER 4

health record progress, visual graphs of user progress and 4 navigation buttons with a centrally located SOS button.

From the home screen, user can first go to the medication page to add, view, edit and delete their medication schedule or any important medical information, it can set the reminders for the medication intake time too, if any mistake can review and edit or delete the reminder later.

Next come to the exercise page, the user can first select from different exercise categories, elderly users may choose lighter and easier exercises according to their capabilities. After the elderly select their exercise video and follow the exercise guiding video based on their preferences or interest.

Besides, the health log page allows the user to record their daily meals by text or voice record or input with images, water intake and sleep hours, the elderly can log their daily meals manually or through voice input, they still can view, edit and delete the records after they added. The water intake section allows users to check in every glass of water they drink, while a progress bar displays users daily drinking progress. In addition, it was allowed to record their sleep hours on previous night for tracking purposes.

Furthermore, there is a settings page which can let user view and update their profile information provided during registration of their account. Other than that, the user can review and edit the emergency contact details such as emergency contact person name, phone number and relationship so in case anything happened they could make faster communication.

Finally, the SOS button will be always ready for the elderly in the middle bottom of the pages so that they can get the first rescue when they meet any emergency while using this application.

All data whether newly added, updated or deleted will automatically store and synchronized in Firebase in real time.

4.2 Class Diagram

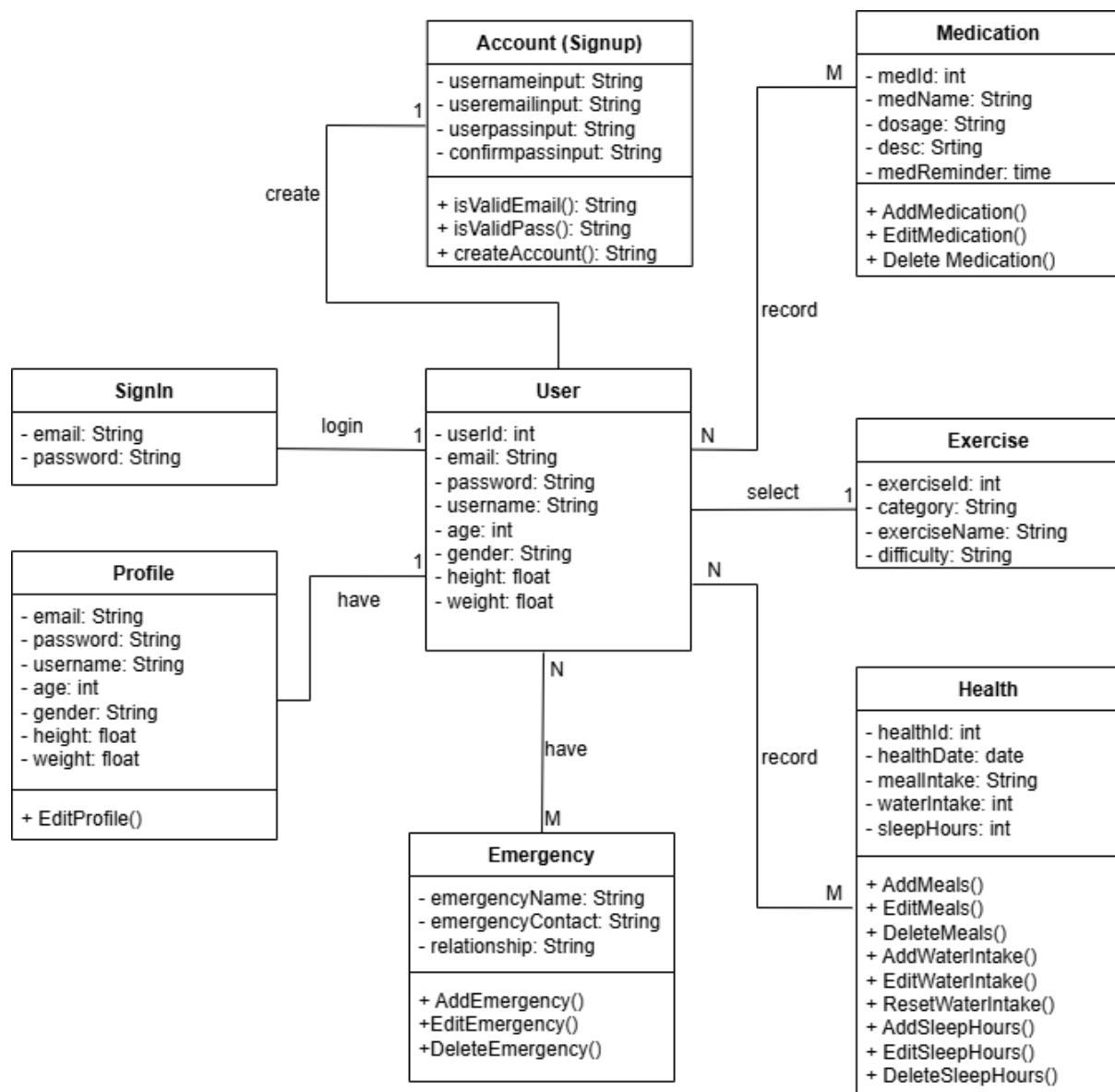


Figure 4.2 Class Diagram of Fitness and Health Application for Elderly

This class diagram of fitness and health application for elderly present how different components interact with one other. First, The **Account (Signup)** class handles new user registration with attributes like usernameInput, useremailInput, userpassInput, and confirmpassInput, and methods such as isValidEmail(), isValidPass(), and createAccount(). It creates a **User** object, which stores userId, email, password, username, age, gender, height and weight. Once the account is created, it can proceed with the **SignIn** class, with email and password attributes, facilitates user login and connecting to **User** class. Users can also update their personal information through **Profile** class with its attributes email, password, username, age, gender, height, weight and the methods EditProfile(). The User can have multiple **Medication** records, including its attributes medId, medName, dosage, desc and medReminder, with methods of AddMedication(), EditMedication() and DeleteMedication(). Then, Users can also select from various **Exercise** options, categorized by attributes exerciseId, category, exerciseName and difficulty. In addition, the **Health** class enables users to record daily health data with attributes healthId, healthDate, mealIntake, waterIntake, sleepHours and its methods of AddMeals(), EditMeals(), DeleteMeals(), AddWaterIntake(), EditWaterIntake(), DeleteWaterIntake(), AddSleepHours(), EditSleepHours() and DeleteSleepHours(). For safety, **Emergency** class stores emergency contact details linked to each user with attributes of emergencyName, emergencyContact, relationship and its method of AddEmergency(), EditEmergency() and DeleteEmergency(). Overall, this class diagram is displaying a clear relationship between user and the main health, exercise, medication and safety features provided by the application.

4.3 Entity Relationship Diagram (ERD)

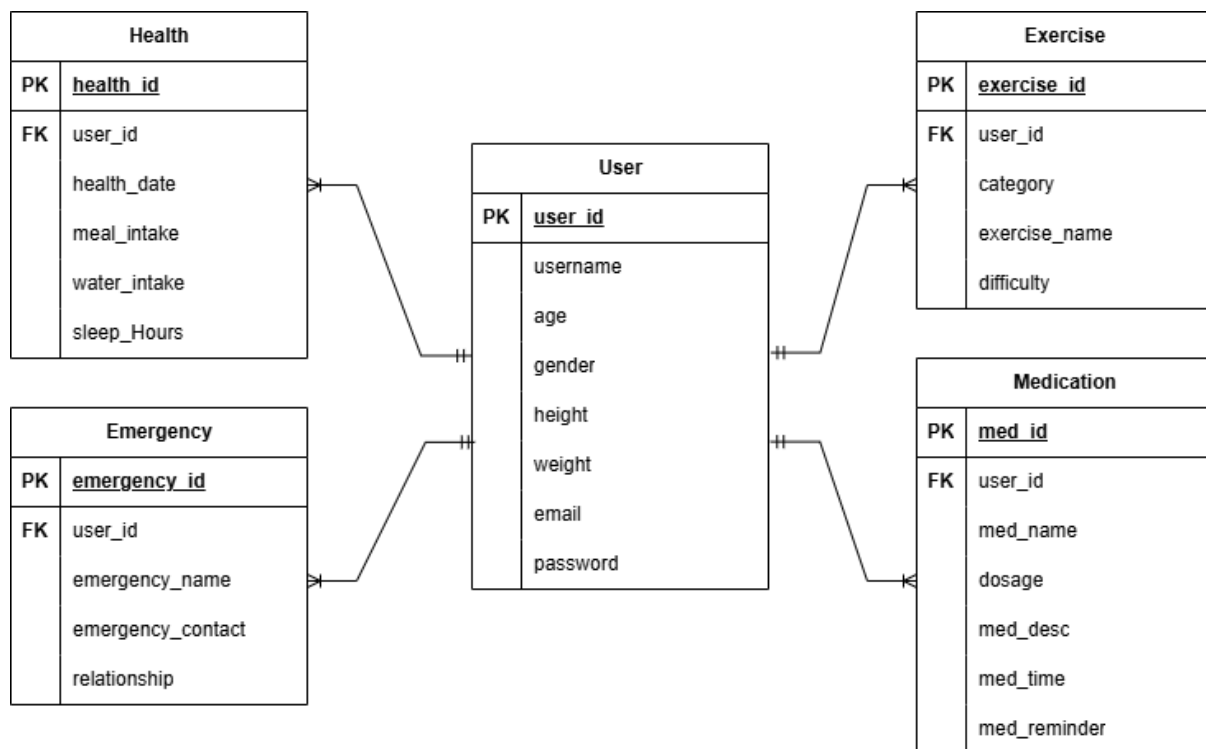


Figure 4.3 Entity Relationship Diagram (ERD) of Fitness and Health Application for Elderly

The Entity Relationship Diagram (ERD) represents the database structure for a Fitness and Health Application for Elderly models a system to manage user information, medications reminders, exercise library, health log and emergency settings, with relationships defined through primary and foreign keys. The central entity “User” with its Primary Key (PK), store the user details such as username, age, gender, height, weight, email and password, it also serves as the parent entity for most others. Each user can be associated with multiple records across 4 different modules which is Health, Exercise, Medication and Emergency, forming one-to-many relationships.

Next, the Medication entity manages by storing the attributes of med_id, med_name, dosage, med_desc, med_time, med_reminder and user_id as a Foreign Key (FK) that connecting to user, which means one user can have many medication records, but one record only belongs to one user. The Health entity records daily wellness information with the attributes of health_date, meal_intake, water_intake, sleep_hours and same with Medication entity having user_id as Foreign Key (FK), allows the user to have many health logs but each health log only

CHAPTER 4

belongs to one user. Then, Exercise entity stores details of category, exercise_name, difficulty and user_id, so the user can access to many exercises, but one exercise only belongs to one user. Lastly, the Emergency entity keeps information about the emergency contact person with attributes emergency_name, emergency_contact, relationship and user_id which used to connect user to have many emergency records but each emergency records only belongs to one user. In summary, the ERD ensures that the data is organized, normalized and structured to support user with their features such as health logging, medication scheduling, emergency support and exercise guidance within the application.

4.4 Project Timeline

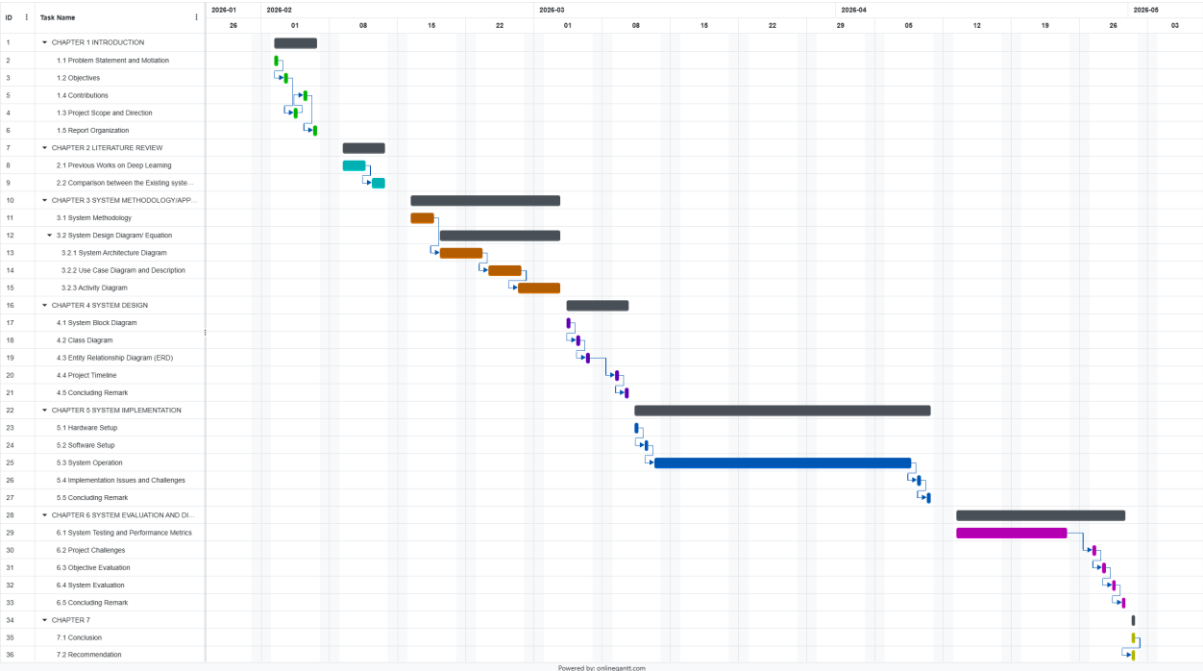


Figure 4.4 Project Timeline

4.5 Concluding Remark

To summarize, this chapter has provided a thorough overview of the system design for the proposed Fitness and Health Application for Elderly, including major design elements such as the system block diagram, class diagram and entity relationship diagram (ERD). Together, these diagrams have depicted the system design in terms of its structure, behavior, and interaction, outlining the system's operation and the inter-relationships among its various modules.

The system block diagram has provided a high-level overview of the system flow, from user registration and login to the navigation through the main functional modules of medication, exercise, health, settings, and emergency SOS features. This overall design ensures the application flow is straightforward, coherent and user-friendly, which is essential for older users who may suffer from a digital divide due to their difficulty in learning how to use complex technology.

Furthermore, the class diagram has outlined the system's inner workings with the main classes, attributes and methods. It shows the associations between key entities such as User, Medication, Exercise, Health and Emergency and illustrates the use of object-oriented design principles to achieve modularity, maintainability and scalability. This organization supports the effective development of the system and future changes with minimal impact on existing features.

Additionally, the entity relationship diagram (ERD) is a visual representation of the database design, showcasing the data structure, storage and management in the system. The primary and foreign key help maintain the integrity and consistency of the data, while the one-to-many relationships between the User entity and other modules allow for efficient management of many records such as health logs, medication lists and emergency contact information.

In summary, the system design is user-centred, with a particular focus on accessibility, simplicity, safety and efficiency to meet the needs of older adults. Through the integration of core health management features, structured system development and database design, this chapter lays the bedrock for future system development. This design not only guarantees that the application will work, but also facilitates its maintainability, scalability and practical utility for the end users.

Chapter 5

System Implementation

5.1 Hardware Setup

The hardware involved in this project is a laptop and an iOS mobile device. A laptop is issued for the process of developing a fitness and health application for elderly. A mobile device is used for testing and deploying this application.

Table 5.1 Specifications of laptop

Description	Specifications
Model	ASUS TUF Gaming A15 FA507NUR_FA507NUR
Processor	AMD Ryzen 7 7435HS
Operating System	Windows 11 Home Single Language
Graphic	NVIDIA GeForce RTX 4050 Laptop GPU
Memory	32GB DDR4 RAM
Storage	500GB SSD 1TB HDD

Table 5.1.2 Specifications of iOS mobile phone

Description	Specifications
Model	iPhone 14 pro
Processor	A16 Bionic chip
Operating System	iOS 26
Memory	6GB of LPDDR5 RAM
Storage	256 GB

5.2 Software Setup

The application's development environment incorporated carefully selected tools for implementing user authentication and functionality of fitness and health application for elderly. This setup enabled seamless coordination between the mobile interface, login/registration systems and database operations, while maintaining security and performance standards throughout the development lifecycle. Before starting to develop the Fitness and Health Application for Elderly, there are four tools that needed to be installed and downloaded in my laptop and mobile phone:

Table 5.3 Software used for Fitness and Health Application for Elderly

Tools	Specification	Description
Visual Studio Code	Version: 1.106.3 (user setup) Electron: 37.7.0 ElectronBuildId: 12781156 Chromium: 138.0.7204.251 Node.js: 22.20.0 V8: 13.8.258.32-electron.0 OS: Windows_NT x64 10.0.26100	Visual Studio Code is a simple but powerful code editor built by Microsoft, designed for fast development with support for many programming languages and extensions.
Firebase	Cloud Database	It provides cloud computing services, allowing us to store data in virtual database.
Expo Go	sdkVersion: 54.0.18	Expo Go is a mobile application that allows you to preview and test projects on mobile phone instantly, faster and easier the development.
Node.js	v24.8.0	Node.js allows JavaScript to run on the server side.

5.3 System Operation

5.3.1 Welcome Screen Segmentation

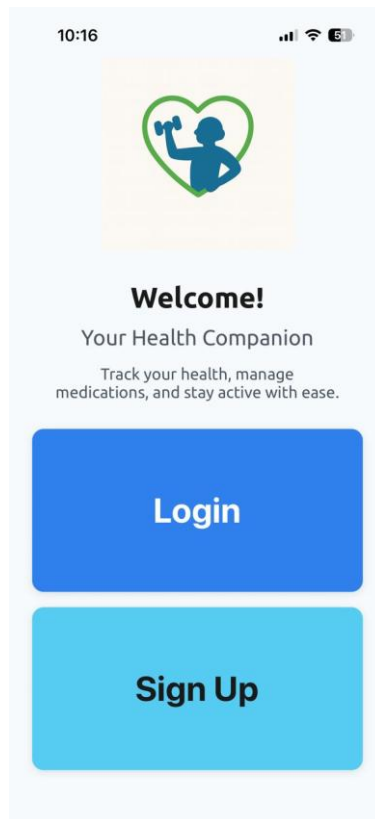


Figure 5.1 Welcome Screen

Figure 5.1 Welcome Screen displays the application logo on the top section of this screen with a brief mission statement which indicates the intention of the Fitness and Health Application to the Elderly. Its mission statement is meant to provide the user with a flash preview of the purpose of the app, which is to assist the elderly to care about their well-being, be active and manage their health. On the screen, below the logo and mission are two main action buttons which are Login and Register. The Register button is used by new users and the Login button opens a personalized dashboard to existing users. The design is maintained low and easy, where the elderly users can use the interface without any problems.

5.3.2 Login Screen Segmentation

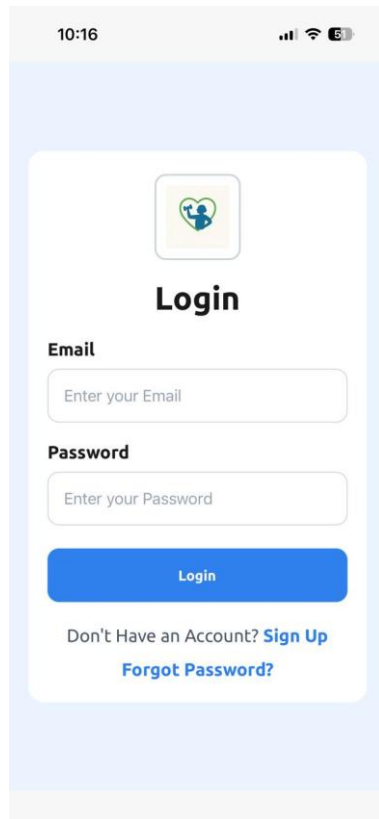


Figure 5.2 Login Screen

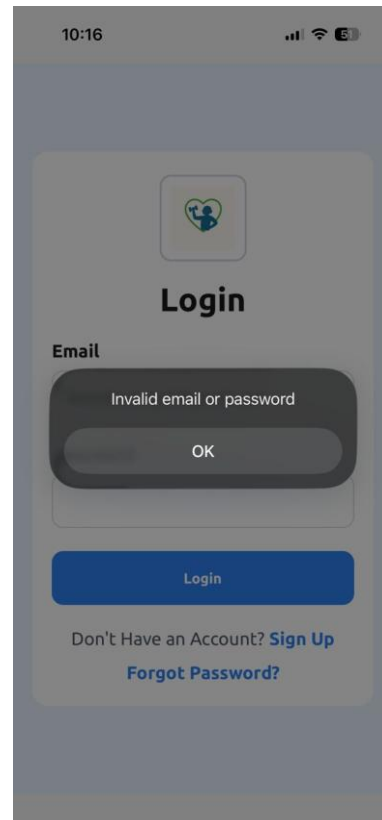


Figure 5.3 Login Screen (With invalid email address or password)

Figure 5.2 Login Screen occurs when the user clicks on the Login option on the Welcome Screen. In this page, the existing user can type in their registered email address with the related password to access his or her account. The design is made easy, tidy and conducive to the elderly users, the input fields are also clear and the text easy to read to facilitate easy navigation.

Figure 5.3 Login Screen (with invalid email address or password) shows the login interface when a user enters an incorrect or unregistered email or wrong password. The system detects the invalid input and displays a toast error message: *"Invalid email or password."*, prompting the user to retry or sign up. The design ensures clear error feedback while maintaining a simple login layout.

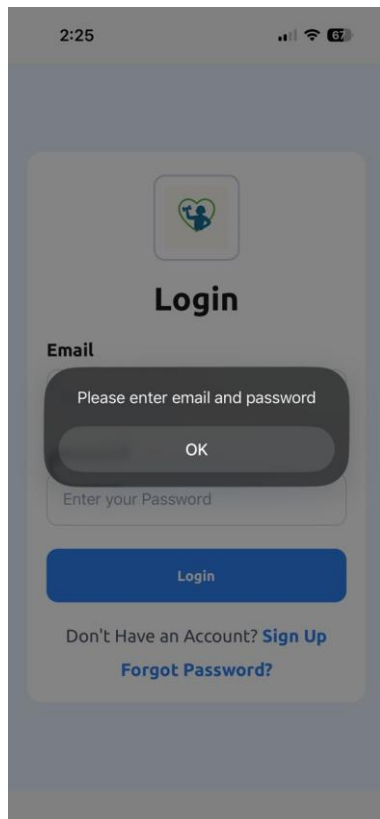


Figure 5.4 Login Screen
(Empty field)

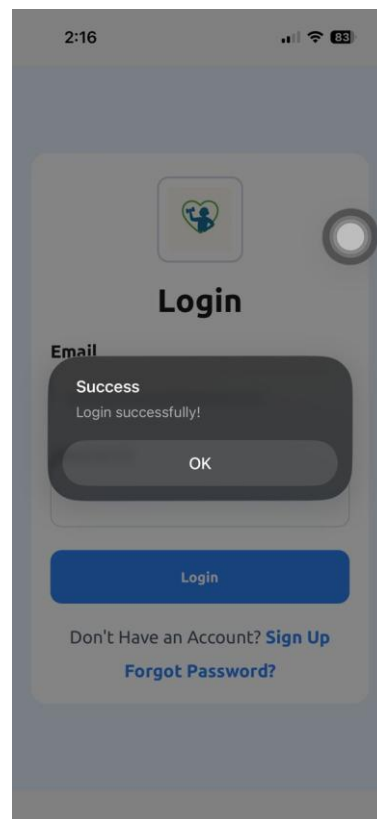


Figure 5.5 Login Screen
(with success message)

Figure 5.4 Login Screen (empty field) shows the login interface when the user leaves an empty field of email or password. The system detects the invalid input and displays a toast error message: *"Please enter email and password."*, prompting the user to fill in the email and password.

Once the user has logged in with the correct email and password, a successful message will appear in **Figure 5.5** that tells the user they have logged in successfully and will be navigating to the home screen.

5.3.3 Register Screen Segmentation

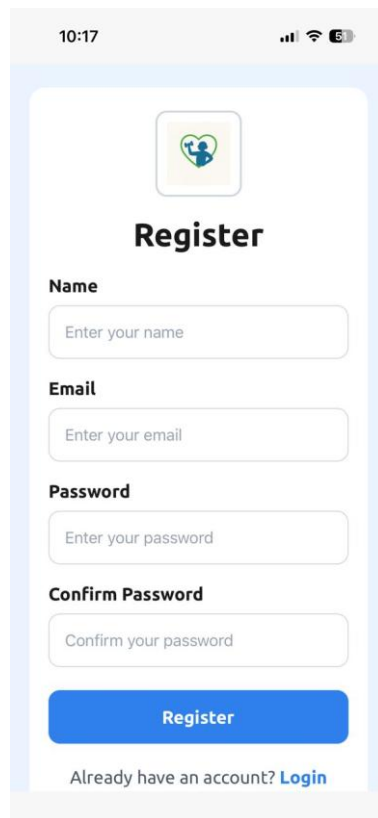


Figure 5.6 Register Screen

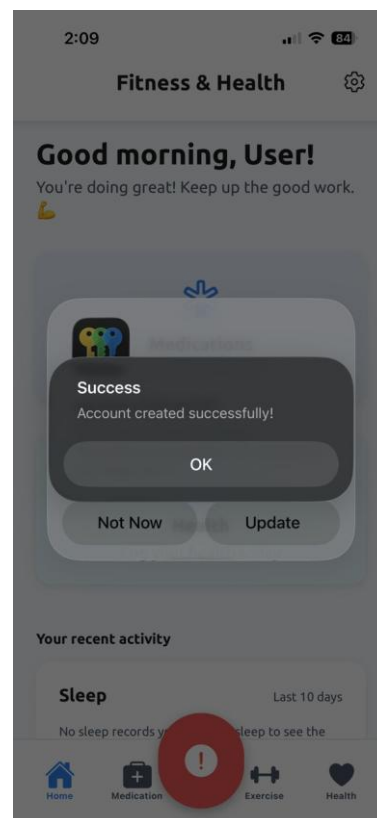
Figure 5.7 Register Screen
(with success message)

Figure 5.6 Register Screen displays the registration interface of the Fitness and Health application for Elderly, featuring a clean and intuitive layout. At the top, the application's logo is prominently displayed. Below it, users encounter four essential input fields: a Username Box for creating a unique identifier, a Mailbox for entering a valid email address, a Password Box for password entry with security requirements and a Confirm Password Box for password validation. These fields guide users through the sign-up process seamlessly, with clear visual cues for data entry. The design prioritizes user-friendliness while maintaining security standards for account creation. After the user has filled in all the information needed and pressed the “Register” button, it will pop out a success message “Account created successfully” as shown in **Figure 5.7** and then navigate to the home screen.

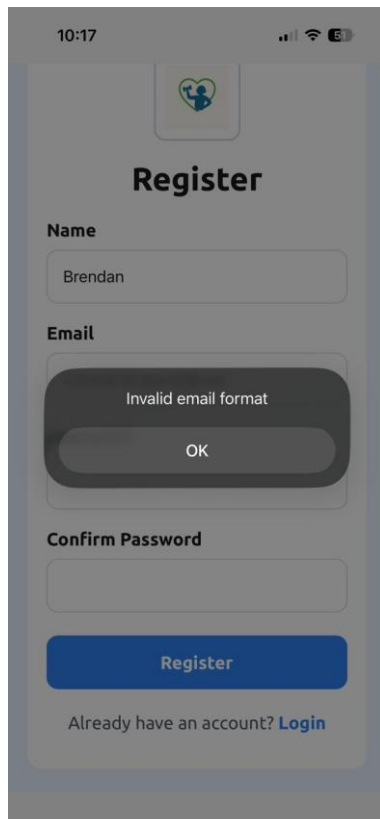


Figure 5.8 Register Screen
(With invalid email address)

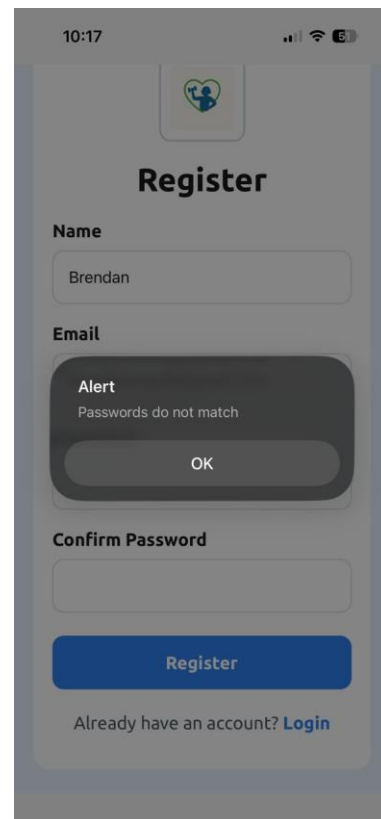


Figure 5.9 Register Screen
(With password mismatch)

Figure 5.8 Register Screen (with invalid email address) demonstrates the application's input validation feature when users enter an improperly formatted email address. A toast message pops up stating *"Invalid Email. Please enter a valid email"*, clearly indicating the error without disrupting the overall sign-up flow. This real-time validation helps users correct mistakes immediately, maintaining the interface's user-friendly approach while enforcing data integrity requirements. The design ensures users understand exactly what needs correction while keeping other entered information intact.

Figure 5.9 Register Screen (with password mismatch) demonstrates the application's form validation feature during user registration. The interface displays visual emphasis on the password confirmation section. When users enter mismatched passwords in the "Password" and "Confirm Password" fields, the system immediately detects the differences and displays a toast notification with the error message: *"Password doesn't match. Please Try Again!"* This real-time validation prevents submission of inconsistent credentials while guiding users to correct their input.

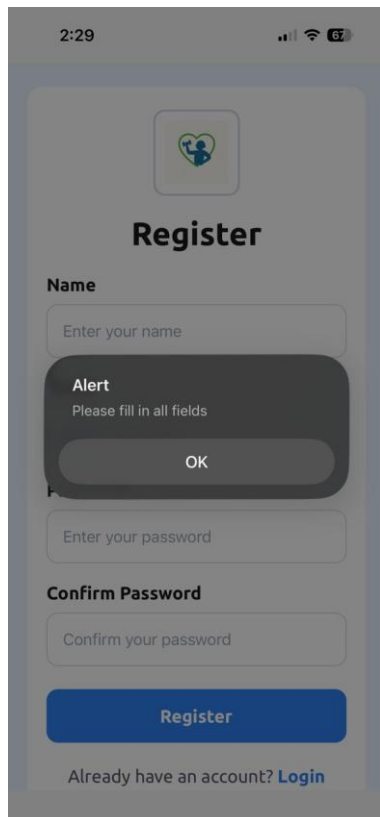


Figure 5.10 Register Screen
(Empty Field)

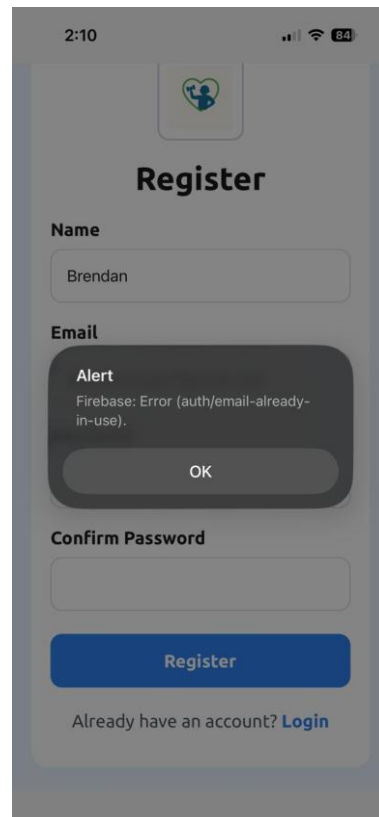


Figure 5.11 Register Screen
(Existed email)

Figure 5.10 Register Screen (empty field) shows the register interface when the user leaves an empty field of name, email, password or confirm password. The system detects the invalid input and displays a toast error message: *"Please fill in all fields."*, prompting the user to fill in the empty field with a valid input.

If the user registers with an existing email, an error message will occur in **Figure 5.11** that telling the user that email had been registered before so it won't have duplicated account.

5.3.4 Forgot Password Screen Segmentation

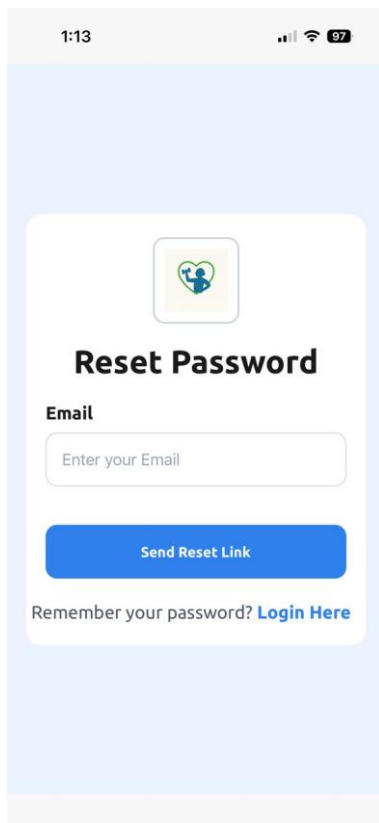


Figure 5.12 Forgot Password
Screen(1)

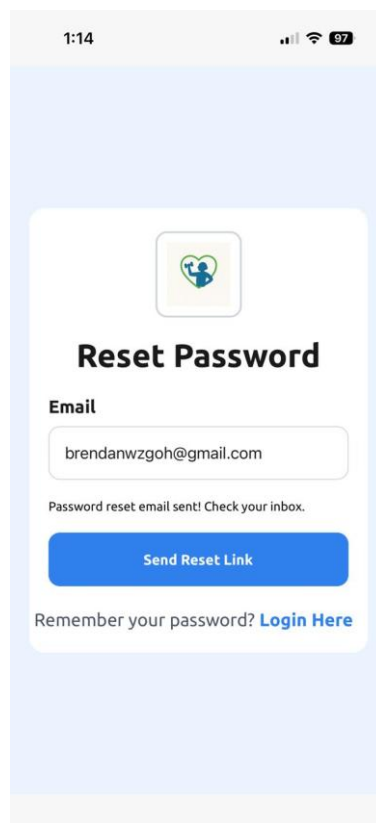


Figure 5.13 Forgot Password
Screen(2)

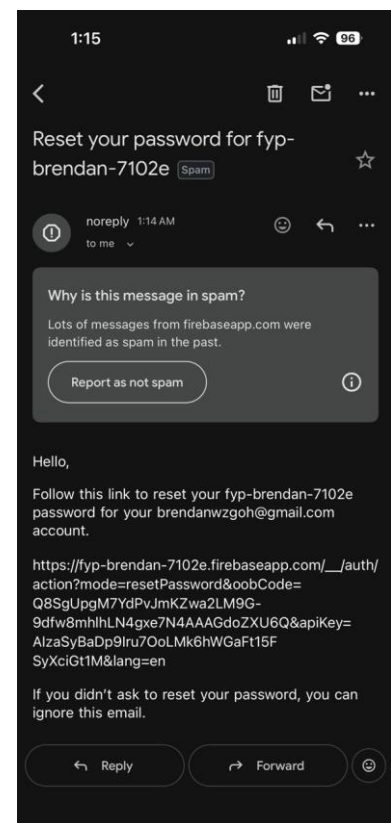


Figure 5.14 Forgot Password
Screen(Email with Link)

Figure 5.12 shows the first **Forgot Password** screen when a user clicks on the “Forgot Password” link on the login screen because they have forgotten their password on the account. This page was created to help the user through the first phase of their password recovery process by asking the user to fill in the email address linked to his or her registered account.

Figure 5.13 indicates that the user needs to enter their valid and registered email address in the input field given. After typing in the email address correctly, the user can then pass on to click on the reset link button. This will cause the system to create and email the given email address with a password reset message.

Then, the user will be sent an email with a secure password reset link as shown in **Figure 5.14**. This connection will enable the user to access the password reset page safely and they can make and verify a new password to their account. This process is unique and multi-step because by verifying the identity of the user by the registered email makes the process secure.

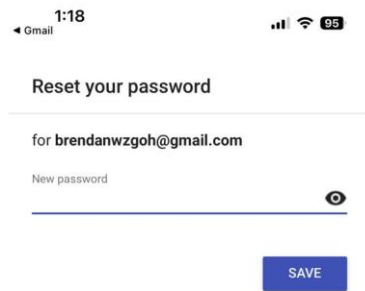


Figure 5.15 Reset Password
Screen



Figure 5.16 Reset Password
Screen(with success password changed)

Figure 5.15 displays the Reset Password screen which appears after the user clicks on the password reset link which is provided in the email. This screen enables the user to create a new password in their account with a lot of security. The user is presented with a new password, which they must key in and in most instances, it is required that the user confirm the new password to avoid typing mistakes.

Once the user has entered the new password, they can proceed by clicking the “Save” button. This will update the account passwords in the system with the new password created. Once the process has been completed successfully, a confirmation message will be displayed, as shown in **Figure 5.16**. The user is informed that the password change is complete and they could go back to the screen to log in with the new password.

5.3.5 Home Screen Segmentation

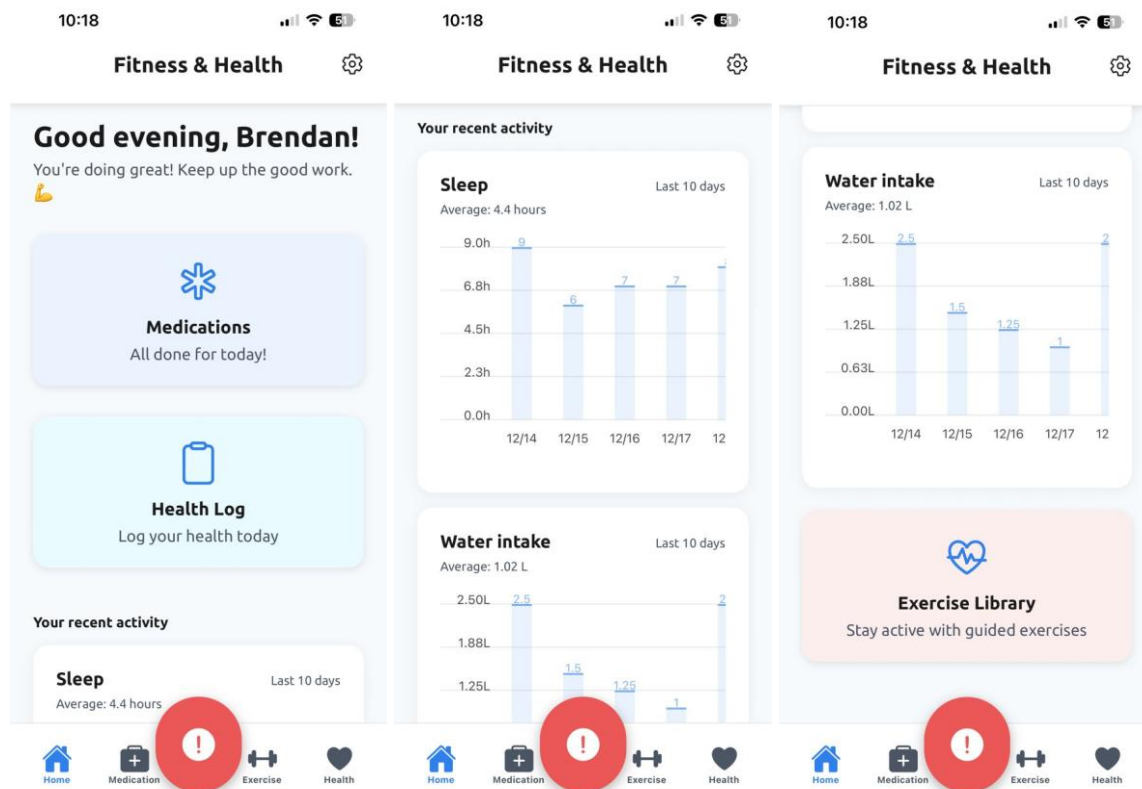


Figure 5.17 Home Screen of
Fitness and Health
Application for Elderly (1)

Figure 5.18 Home Screen of
Fitness and Health
Application for Elderly (2)

Figure 5.19 Home Screen of
Fitness and Health
Application for Elderly (3)

Figure 5.17, figure 5.18, figure 5.19 presents the main dashboard with an easy, user-friendly and senior-friendly so that users who are seniors may easily find the necessary features. The home screen displays major health records including medication alerts, daily health records, average hours of sleep and daily water intake in a lucid and visually readable graphical format. The exercise library is also easily accessible to the user via this dashboard. The navigation bar shows the title of the application Fitness and Health at the center of the top of the screen. In the upper-right-hand side, a Settings icon is provided, which enables one to navigate to the settings page to modify personal information or emergency contact. The bottom navigation bar has 5 major buttons that are left to right. Firstly, there is the home icon, Medication page icon, Exercise Library icon, Health Log page icon and a large SOS button in the middle of the bar. The reason why the SOS button was designed to be large is to ensure that the user can see it easily and immediately because the user needs emergency attention and thus he needs to press the button.

5.3.6 Medication Screen Segmentation

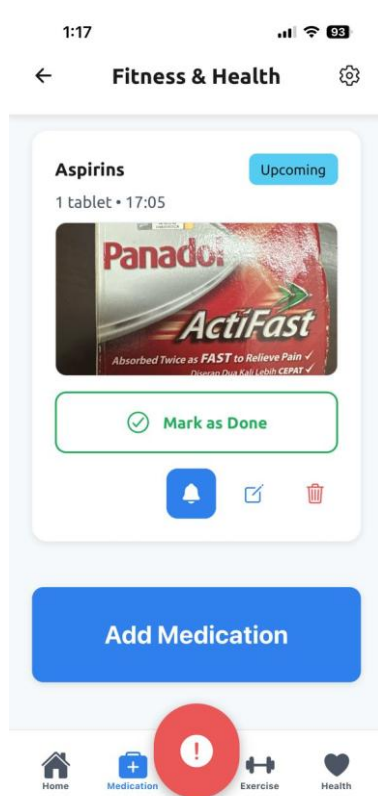


Figure 5.20 Medication
Page (1)

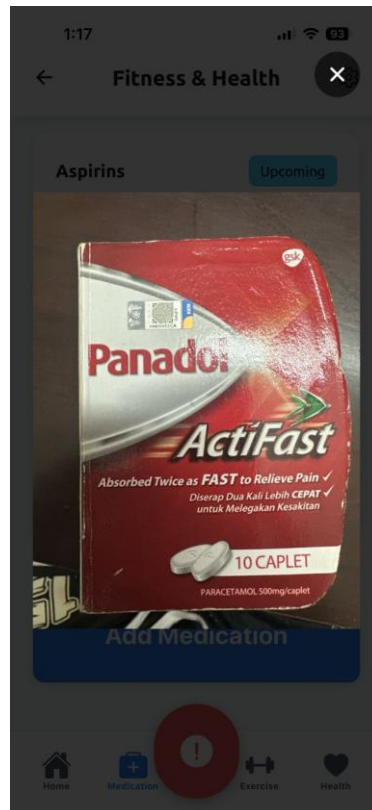


Figure 5.21 Medication
Page (2)



Figure 5.22 Medication Page
(with reminder)

Figure 5.20 shows the medication page whereby users can view and control their medication records. Before having any records, users will have to manually input their medications by pressing the Add Medication button. As soon as one of the medications is added, all the entries are presented in a very clean list with the critical information displayed in a well-structured and easy-to-understand format that can be used by elderly users. The medications are entered with each medication entry containing a button “Mark as Done”, where a user can select this option to show that they took their medication of the day. It allows the user to enlarge the image of medicine as shown in **Figure 5.21** so the image can be viewed more easily.

Once the medication reminder is being created, the reminder will appear based on the time set as shown in **Figure 5.22** so the elderly user is able to take the medicine on time.

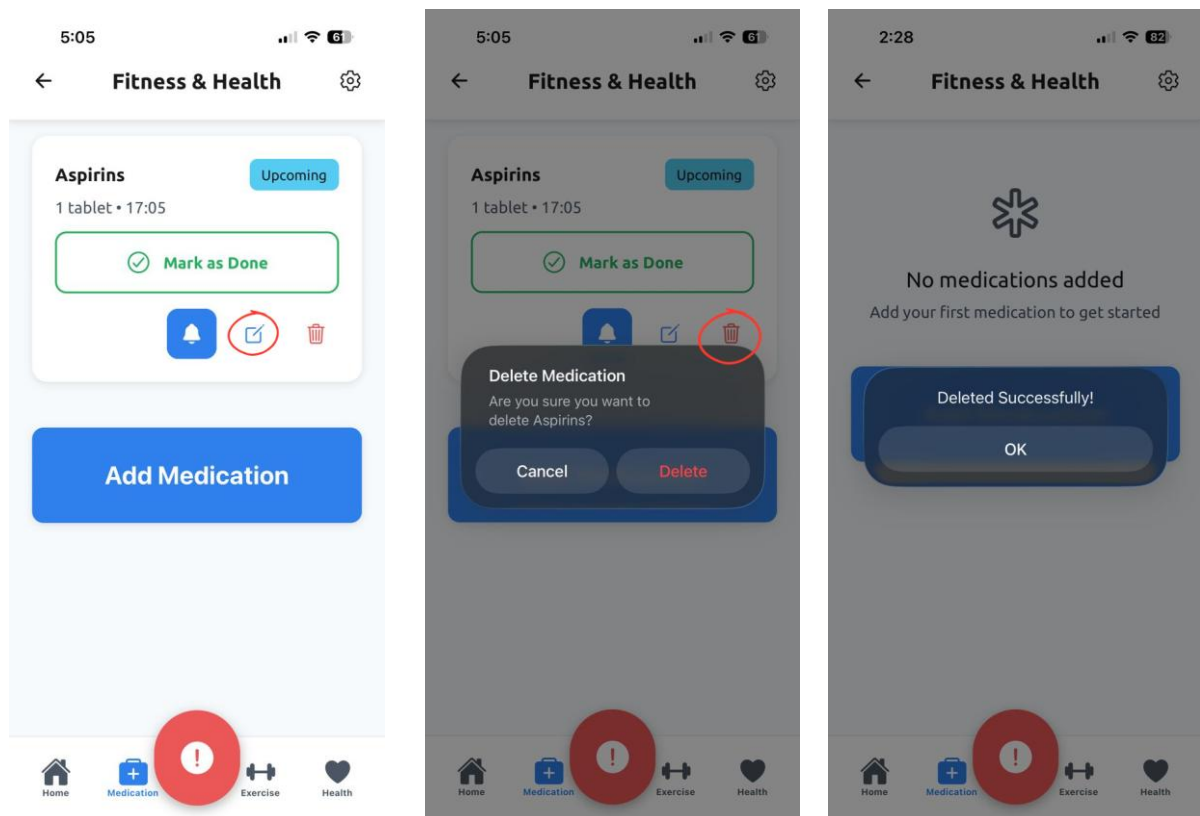


Figure 5.23 Medication Page (edit features) Figure 5.24 Medication Page (delete confirmation) Figure 5.25 Medication Page (delete successfully)

In case any detail is input wrongly or requires some updates, the user can change the information and they can do this by simply clicking on the Edit button as shown in **figure 5.23**. Also, if the user wishes to remove any reminder, they can press the button as shown in **figure 5.24** and it will pop out with a confirmation message. This would help keep the medication list clear, accurate and up to date. After the user confirms with the deletion, an alert message will be displayed in **Figure 5.25** to show that the record has been deleted.

5.3.7 Add Medication Screen Segmentation

1:16

← Fitness & Health

Medication Name *

e.g. Aspirin

Dosage *

1 tablet

Reminder Time *

09:00

Repeat Frequency

1× / day 2× / day 3× / day

09:00

Snap Picture

Snap Picture

No picture attached

1:16

← Fitness & Health

Medication Name *

e.g. Aspirin

Dosage *

Select Dosage

Amount Unit

0.25 mg

0.50 ml

0.75 tablet

1 tablet

Cancel Confirm

Figure 5.26 Add Medication Page (1) Figure 5.27 Add Medication Page (2)

1:16

← Fitness & Health

Medication Name *

e.g. Aspirin

Dosage *

Select Time

Hour Minute

00 00

01 05

02 10

09:00

Cancel Confirm

1:17

← Fitness & Health

Repeat Frequency

1× / day 2× / day 3× / day

09:00

Snap Picture

Snap Picture

Panadol ActiFast

Absorbed Twice as FAST to Relieve Pain ✓

Save Medication

Cancel

Figure 5.28 Add Medication Page (3) Figure 5.29 Add Medication Page (4)

Figure 5.26 presents the Add Medication page which will be navigated after the user presses the button "Add Medication". In this page, users are expected to provide necessary data including name of medication, dosage, set the reminder time, user can choose to repeat the reminder once, twice or thrice per day. Besides, it also allows the elderly user to take the picture of the medicine to help them remember how the packaging looks like. The design is maintained minimally, easy to use so that the aged may not have a problem with filling in their medication information.

The dropdown list to be used to choose the dosage and reminder time is presented in **Figure 5.27 and Figure 5.28**. This will enable the elderly user to find it easy to choose the accurate dosage and select a certain time to be reminded to take his medication and this will enhance convenience and the user will find it easy to take the medicine in good time. Then, the user is allowed to take a picture of the medicine as shown in **Figure 5.29** for easy look back when it's the time to take medicine.

After every information is filled, press the "Save Medication" button to save the medication reminder or press "Cancel" to revert everything and back to Medication Screen.

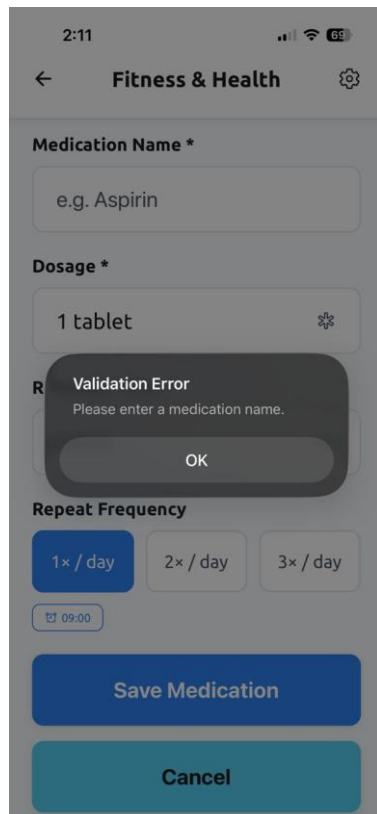


Figure 5.30 Add Medication
Page (with validation)

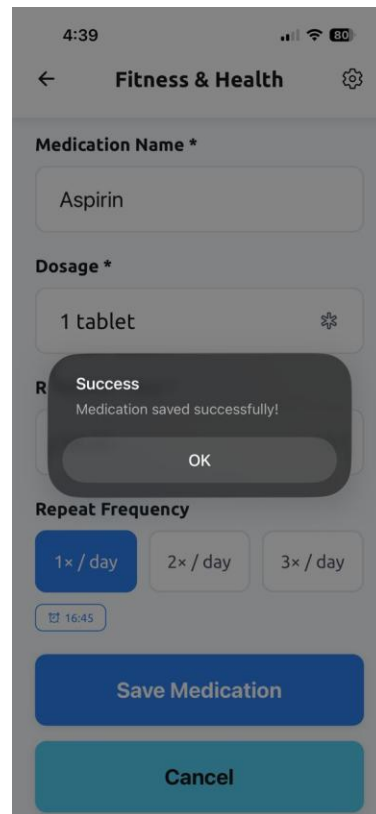


Figure 5.31 Add Medication
Page (with success message)

If the user did not type the name of a medication, the system will show an error message to the user to do so. The user is informed that the input field cannot be left empty because as seen in **Figure 5.30**, there is a message “Please enter a medication name”. This validation makes sure that every detail is filled in before progressing hence no incomplete or untrue information is registered in the system.

After entering all the required information, the user can press the button to save medication so that all the information is saved in the database. It will show a success message as shown in **Figure 5.31**. The new medication will then be displayed on the Medication Page. In case the user does not want to proceed, they can press the Cancel button and leave without saving any information.

5.3.8 Exercise Screen Segmentation

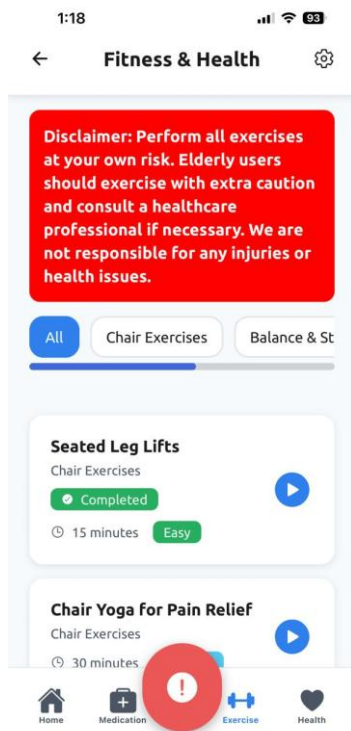


Figure 5.32 Exercise Library
Page

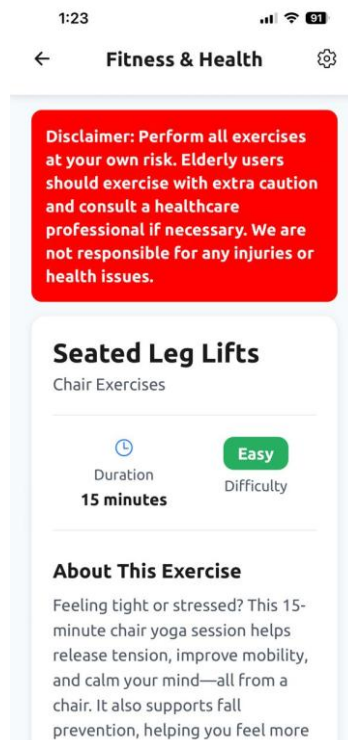


Figure 5.33 Exercise Details
Page (1)

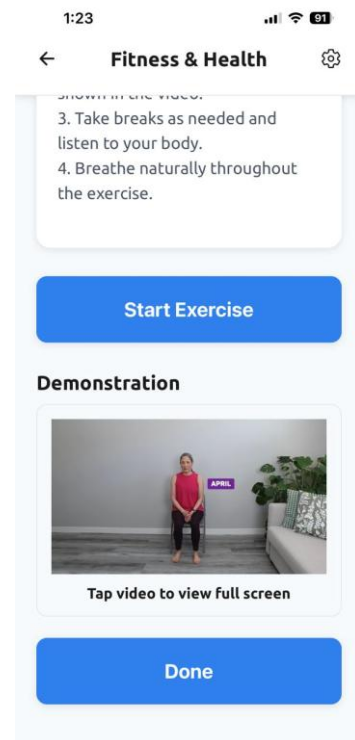


Figure 5.34 Exercise Details
Page (2)

Figure 5.32 shows the Exercise Library page which has the various exercises that are classified into different categories to enable users easily to find the appropriate exercises to undertake as workouts. One can start by choosing the type of exercise that the user preference. Once they have chosen a category, they have the option of a list of videos of instructional exercises depending on the duration and length of difficulty, such that they can be chosen by the elderly according to their physical ability. In addition, there is a disclaimer that advises users to use the application safely. The application shall not be held responsible for any injuries incurred. Once the exercise is done, the user can press the done button under the video and it will show the complete badges in the exercise library screen.

Besides, the detailed screen of the exercise information is shown in **figure 5.33**. In this case, the user will be able to see valuable information about the chosen exercise, including its purpose, instruction, duration and difficulty. This information assists the user to have knowledge of how the exercise will be undertaken prior to the commencement of the exercise. When it is time, the user will be able to press the Start Exercise button to go through the instructional video which shown in **figure 5.34**.

5.3.9 Health Screen Segmentation

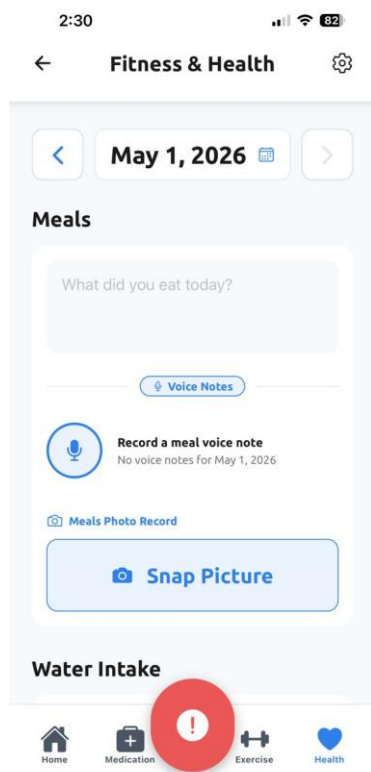


Figure 5.35 Health Log
Screen (1)

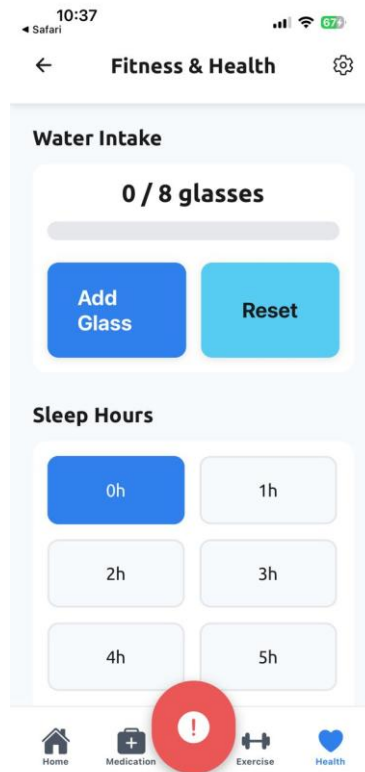


Figure 5.36 Health Log
Screen (2)

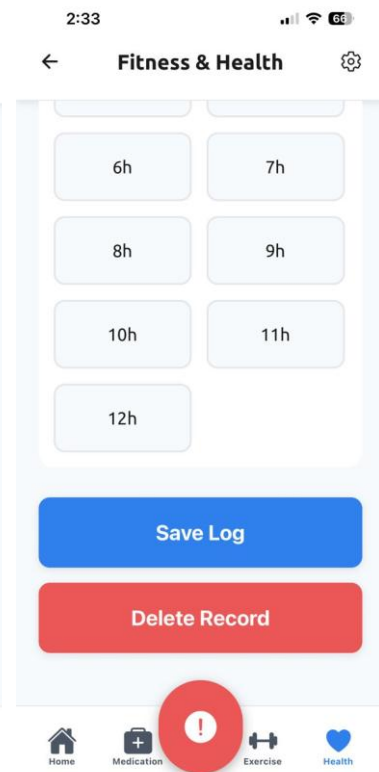


Figure 5.37 Health Log
Screen (3)

The Health Log Screen shown in **Figure 5.35**, **Figure 5.36** and **Figure 5.37** enables the user to track his or her daily meal, water intake and sleep hours. In the top left or right arrow, a user can first choose the date to record. They may then input the foods they ate with the option of the elderly may record their voice of what they have eaten or take the picture of the food eaten to make the task even easier.

In **Figure 5.36**, they will have the option of tapping the 'Add Glass' button every time they have a glass of water so that they can record the water intake to ensure they take the right amount of water as recommended of eight glasses daily. There is also a Reset button in case one makes an entry with an error. Below the water intake, users can select the number of hours they slept by clicking the corresponding button which is shown as **Figure 5.37**.

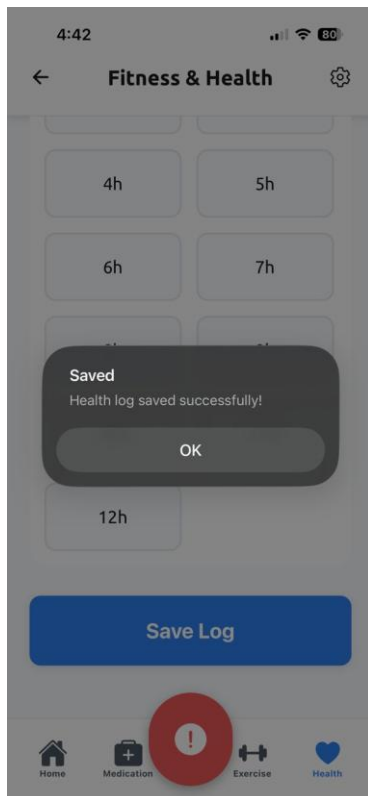


Figure 5.38 Health Log
Screen
(with success message)

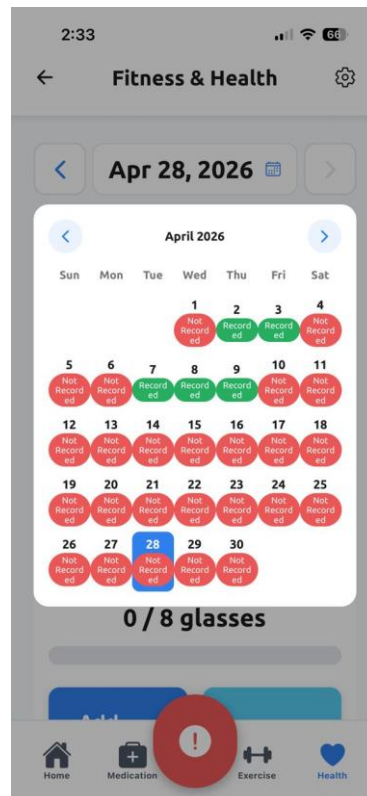


Figure 5.39 Select Health
Date

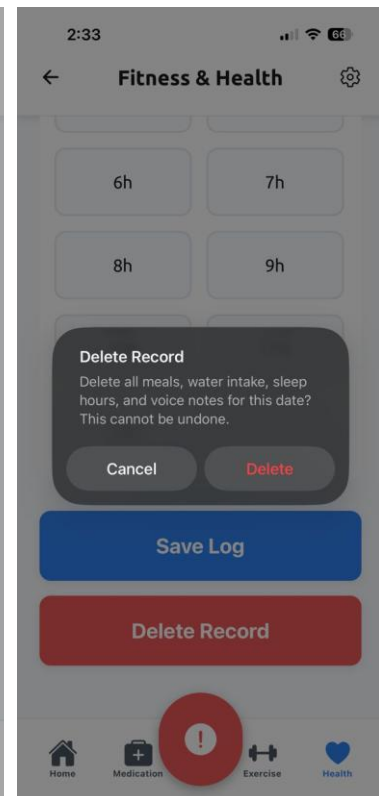


Figure 5.40 Delete Health

Lastly, the user can press the “Save” button after all the information have entered correctly, a success pop out message will be shown as in **Figure 5.38**, all the data will be updated in the database. In addition, users can always look back and edit the previous health record for any inquiries based on the dates. If the elderly users want to see their history, they can click the date on the top to view the calendar as shown in **figure 5.39**. The elderly can view the status of each day and see which days are recorded and which days are not, so they know their history.

Elderly can delete any record by pressing the “Delete Record” button at the bottom of the form. A confirmation will pop out which displayed in **figure 5.40**. This will delete all records that have been created for that particular date. This enables users to update and maintain their data as needed, ensuring that only the most up-to-date and relevant information remains in the system.

5.3.10 Setting Screen Segmentation

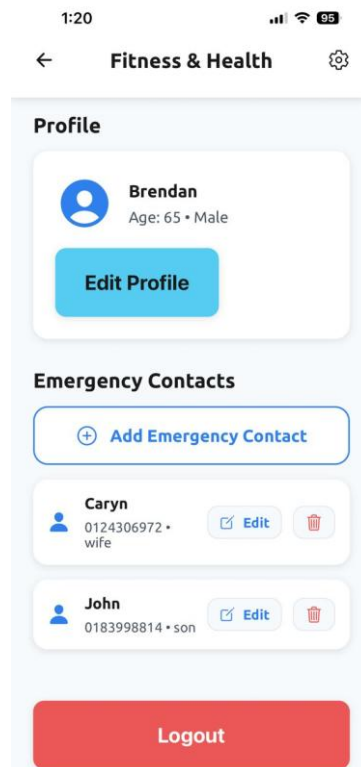


Figure 5.3.41 Setting Screen

The Settings screen appears in **figure 5.41** and may be accessed after clicking on the upper right icon on the home screen. Personal information and emergency contacts are available on the Settings screen. Before using the application, users are obliged to enter their personal data. There is always an Edit Profile button that a user can use when the information has any errors that are made on the first input. Besides, users will have the ability to create some emergency contacts to enable them to make a fast call during an emergency.

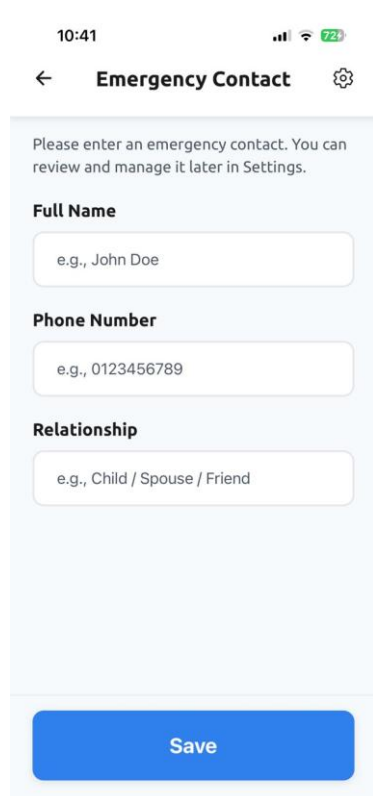
5.3.11 Profile Screen Segmentation

Figure 5.42 Edit Profile Screen Figure 5.43 Edit Profile Screen
(with success message)

Figure 5.42 presents the Edit Profile page when the user clicks on the button of edit profile. Users can update their personal data on this page such as name, age, gender, height and weight. The existing information is pre-filled to make it convenient and enable the user to edit it effectively.

Once the information needed is updated, the user will be able to press the button to save the changes to send the altered information. The system will then add the new information to the database and show a successful message to indicate that the update is done as indicated in **Figure 5.43**. Alternatively, in case the user chooses to abandon the changes, a click on the button of the Cancel will erase all changes and the user will go back to the previous page without making any changes.

5.3.12 Add Emergency Contact Segmentation



10:41

← **Emergency Contact** ⚙️

Please enter an emergency contact. You can review and manage it later in Settings.

Full Name

e.g., John Doe

Phone Number

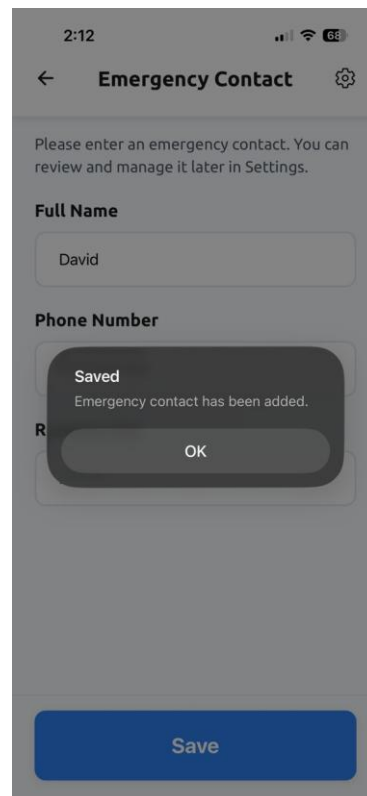
e.g., 0123456789

Relationship

e.g., Child / Spouse / Friend

Save

Figure 5.44 Add Emergency Contact Screen



2:12

← **Emergency Contact** ⚙️

Please enter an emergency contact. You can review and manage it later in Settings.

Full Name

David

Phone Number

Saved
Emergency contact has been added.

OK

Save

Figure 5.45 Add Emergency Contact Screen (with success message)

The screen in **Figure 5.44** is the one that appears when the user has pressed the “Add Emergency Contact” button on the Settings page. In this page, the user must fill in all the fields marked as compulsory as the full name, phone number and relationship to create a new emergency contact record. The fields should be filled appropriately to make the information about contacts accurate and useful.

The user is then able to save the information by clicking the “Save” button once all the necessary information has been inputted. The new emergency contact details will then be processed and stored in the database by the system. When successfully submitted, a confirmation message will be shown to the user to confirm that the addition of the contact has been successfully made, which can be seen in **Figure 5.45**.

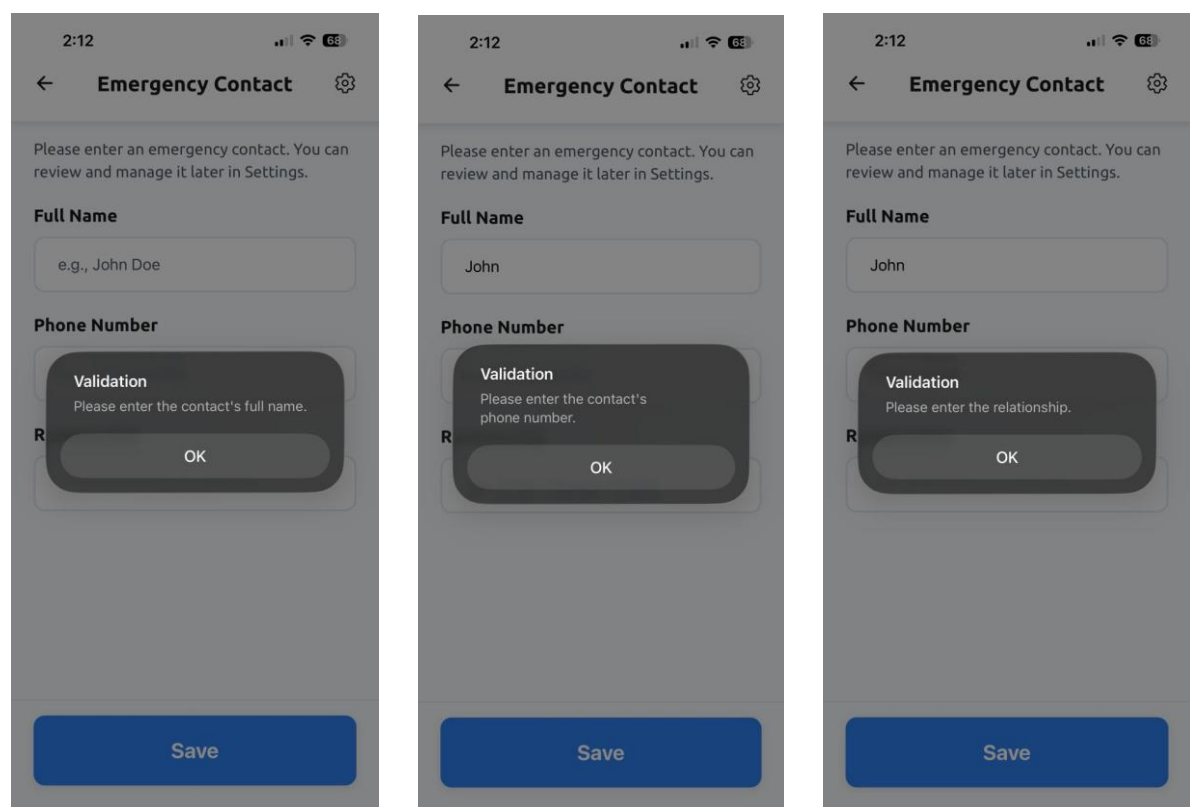


Figure 5.46 Add Emergency Contact Screen (with validation) (1)	Figure 5.47 Add Emergency Contact Screen (with validation) (2)	Figure 5.48 Add Emergency Contact Screen (with validation) (3)
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The validation of the input fields which are full name, phone number and relationship are shown in **Figure 5.46, 5.47 and 5.48**. These checks help in making sure that all the information needed is typed in correctly before the form could be submitted. In case, any of these fields are not filled or not filled correctly, the system will provide a validation message to inform the user.

The message will also give a clear indication of what field needs to be addressed and to ensure that the user gives the information accordingly. This validation process assists in ensuring that the data remains correct and that just a few incomplete records are not stored in the system.

5.3.13 Emergency contact Screen Segmentation

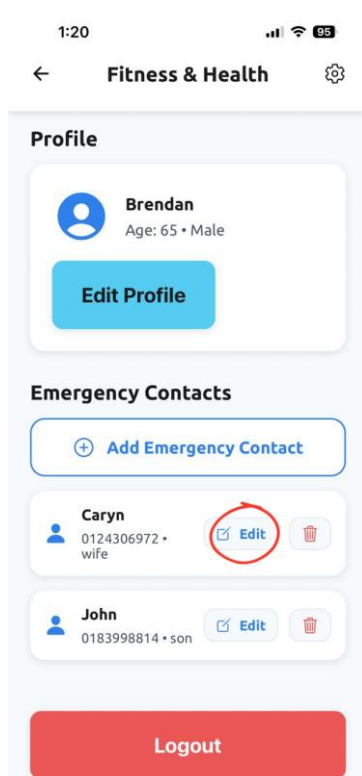


Figure 5.49 Edit Emergency Contact

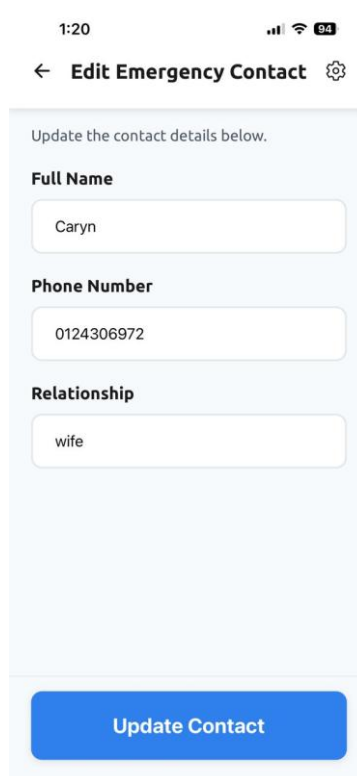


Figure 5.50 Edit Emergency Contact Screen

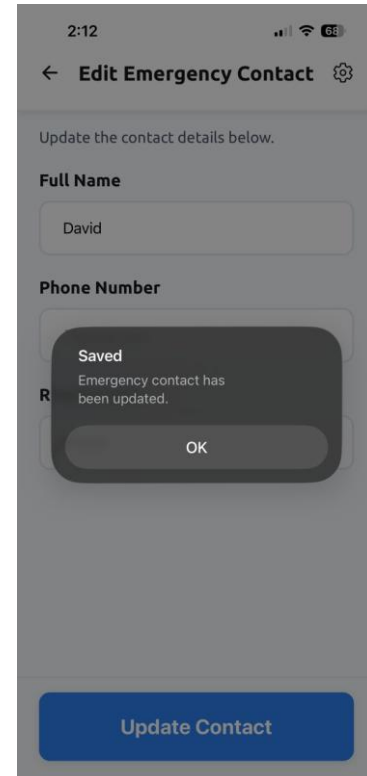


Figure 5.51 Edit Emergency Contact Screen (with success message)

In **Figure 5.49**, the user is able to click on the edit icon for each emergency contact displayed on the Settings page. This will enable the user to edit the information of any preexisting contact separately. After clicking on the edit icon, the system will direct the user to the Edit Emergency Contact page as shown in **Figure 5.50**, which already has all the information previously entered (full name, phone number and relationship) to save time.

The user then has the option of updating any of the available details as desired. The user would then have to save the altered information by clicking the button marked as update contact. When a successful submission is made, then the system will update the record after which a confirmation message as displayed in **Figure 5.51** will be shown to the user that the changes have been saved successfully.

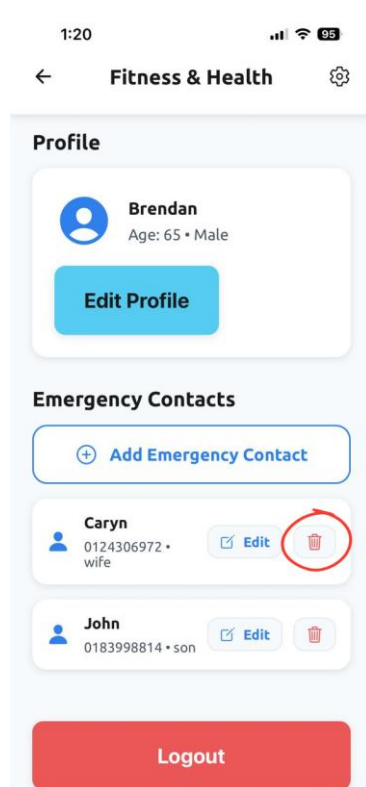


Figure 5.52 Delete Emergency
Contact

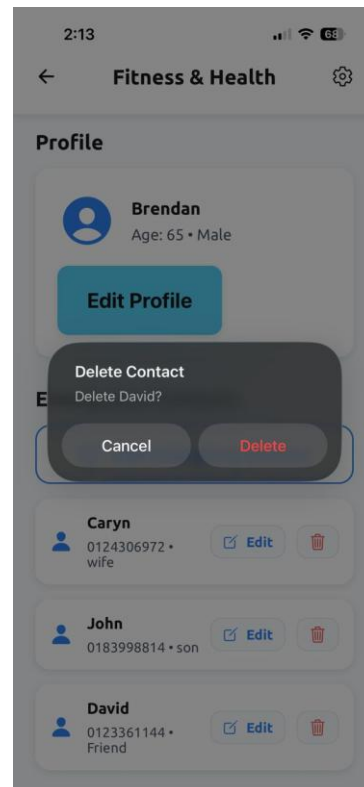


Figure 5.53 Delete Emergency
Contact (with confirmation
message)

On **Figure 5.52**, the user can press the delete icon on the emergency contact listed on the Settings page. This option enables the user to delete any emergency contact of their choice. After clicking on this delete icon, a system will generate a confirmation prompt to avoid deletion by mistake.

A confirmation message will be displayed as indicated in **Figure 5.53**, where the user will be requested to confirm his or her action. The user has to confirm the deletion to be able to remove the chosen contact permanently. When the user decides to cancel, the contact will not be changed. This is a verification process that keeps a user in complete control and prevents accidental loss of data.

5.3.14 SOS Screen Segmentation

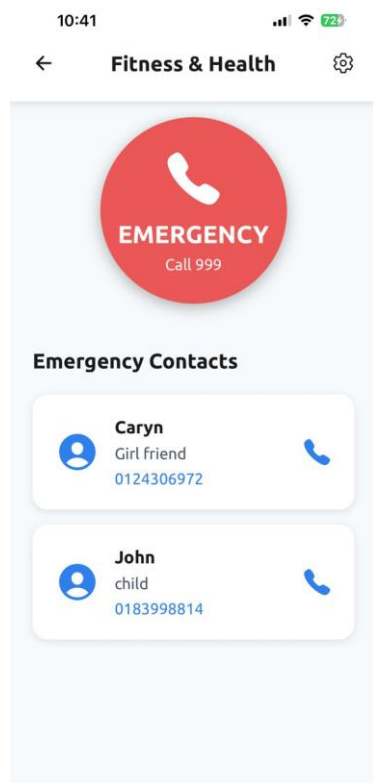


Figure 5.54 SOS Screen

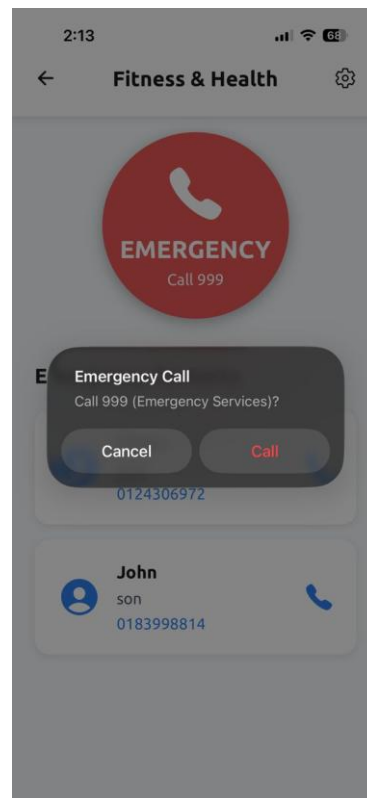
Figure 5.55 SOS Screen
(with confirmation message)

Figure 5.54 presents the SOS screen can be accessed at any moment by clicking the middle red button in the bottom navigation bar. After clicking on the button, the user will be taken to the SOS interface where one can have quick access to emergency help.

The user can use this screen to make an emergency call to 999 in an emergency. In less urgent cases, the user can also make a call to a pre-stored emergency contact such as a family member, relative or the closest hospital contact number. These options will facilitate the fact that relevant assistance may be contacted depending on the acuity of the situation.

The system has a safety confirmation step to avoid accidental activation, especially for the elderly user. There will be a confirmation message prior to the execution of any call and this will be as shown in **Figure 5.55** that will enable the user to confirm the act before they proceed. This is an advantage that minimizes chances of unintended calls but the device can be accessed promptly in cases of emergency.

5.3.15 Logout Screen Segmentation

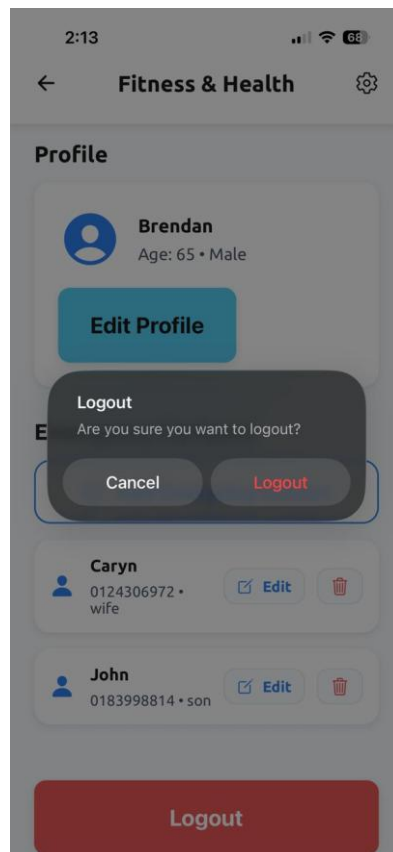


Figure 5.56 Logout

The Settings page allows the user to log out of their account. The red “Logout” button as presented in **Figure 5.56** is placed at the bottom of the page so that it can be easily seen and accessed. The user must go to the Settings page and press on this button to log out.

After the selection, the user will be logged out of their account and redirected to the login screen to make sure their session is terminated. This enables the user to easily leave their account without any threats that may arise when sharing or using common or communal devices.

5.4 Implementation Issues and Challenges

While developing the Fitness and Health Application for Elderly, we encountered certain technical issues and system constraints. A major challenge was the constraint of Expo Go SDK version 54, which does not support speech to text. This limited the addition of voice input options that could enhance accessibility for the elderly. This limited the system to primarily text-based interactions, potentially decreasing its convenience. Potential enhancements include the use of external speech recognition services or a development platform with improved support for voice input.

Another difficulty was the integration with Firebase services, especially with regard to real-time data updates and user authentication. The application heavily relies on network connectivity, which can result in data synchronization issues. Improvements could involve offline caching and synchronization of data to enhance system robustness in poor network connectivity situations.

Overall, the application has been implemented successfully, but these issues point to opportunities for improvement. Overcoming these challenges will improve the system's accessibility, robustness and scalability, leading to a better health monitoring system for older adults.

5.5 Concluding Remark

To conclude this chapter, it has outlined the full development and implementation of the Fitness and Health Application for Elderly, covering hardware and software requirements, system configuration and system operation demonstrated through screenshots. The system design has been successfully implemented as a mobile application with ASUS TUF Gaming A15 and the assistance of Expo Go, Firebase and Visual Studio Code. Rigorous real-world testing was conducted on an iPhone 14 pro to validate performance and device compatibility.

The chapter has also demonstrated the functionality of the system's modules, such as the user register, login, forgot password, medication reminder, exercise instruction, health log and emergency assistance. From the screenshots and descriptions, it is clear that the application is built with simplicity, accessibility and ease of use in mind to meet the needs of the elderly population.

Furthermore, some implementation challenges and concerns were raised, including system limitations, connectivity requirements and user acceptance of mobile technology. These issues point to some current system limitations but also offer insights into future system improvement in terms of interaction, offline support, user instruction and guidance.

In conclusion, the implementation phase has shown that the system design is feasible and can be used by the elderly to assist with health and routine activities. This phase lays the groundwork for the following system evaluation and discussion, where the application's performance and effectiveness will be evaluated.

Chapter 6

System Evaluation and Discussion

6.1 System Testing and Performance Metrics

Register Module

Table 6.1 Test Case Table for Register Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Register with valid details	Valid username, email, matching passwords that meet complex rules. User authenticates.	Account created successfully and saved to Firebase. User is navigated to home page.	As expected.	Test Passed.
Register with existing email	Existing email.	Error message: “Email already in use” shown.	As expected.	Test Passed.
Register with invalid email	Invalid email format.	Error message: “Invalid email format” shown.	As expected.	Test Passed.
Password mismatch	Different password & confirm password.	Error message: “Password do not match” shown.	As expected.	Test Passed.
Register with Empty Fields	Leave all the field or one field empty.	Error message: “Please fill in all field” shown.	As Expected.	Test Passed.

Login Module

Table 6.2 Test Case Table for Login Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Login with valid credentials	Valid email and correct password from the Account collection.	Login successful, go to home screen.	As expected.	Test Passed.
Login with invalid credentials	Wrong email/password.	Error message “Invalid email or password” shown.	As expected.	Test Passed.
Login with Empty Fields	Either email or password field is left blank.	Error message: “Please enter email and password” shown.	As expected.	Test Passed.

Home Screen Module

Table 6.3 Test Case Table for Home Screen Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Navigate to Medication Page	Click on “Medication” dashboard	Jump to Medication Page.	As expected.	Test Passed.
Navigate to Health Page	Click on “Health” dashboard.	Jump to Health Page.	As expected.	Test Passed.
Navigate to Exercise Page	Click on “Exercise” dashboard.	Jump to Exercise Page.	As expected.	Test Passed.

Medication Module

Table 6.4 Test Case Table for Medication Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Navigate to Add Medication Page	Click on “Add Medication” button.	Jump to Medication form.	As expected.	Test Passed.
Add medication (valid)	Fill all the fields: name, dosage, time, repeat frequency and click “Save Medication”.	Medication saved successfully with success message: “Medication saved successfully”. New medication record has been saved in Firebase.	As expected.	Test Passed.
Add medication image	Input with an image of the medicine.	Image saved with the medication reminder and displayed on the medication list screen.	As expected.	Test Passed.
Add medication without name	Empty medication name.	“Please enter a medication name” toast.	As expected.	Test Passed.
Edit medication	Load a medication record. Updated medication details and click “Save Medication” to	Updated successfully with success message: “Medication saved successfully”. Changes are updated in Firebase.	As expected.	Test Passed.

	update the record.			
Delete medication	Delete action confirmed.	Medication removed from Firebase.	As expected.	Test Passed.
Toggle reminder	Turn ON/OFF reminder.	Reminder updated in Firebase.	As expected.	Test Passed.
Mark medication as Done	Press on “Mark as Done” button.	Medication Marked as “Taken”.	As expected.	Test Passed.

Exercise Module

Table 6.5 Test Case Table for Exercise Module

Test Case	Input	Expected Output	Actual Output	Action Taken
View exercise list	Navigate to exercise page.	Exercise list displayed.	As expected.	Test Passed.
Select exercise	Click exercise.	Exercise details shown.	As expected.	Test Passed.
Play exercise video	Click “Start Exercise”	Video plays.	As expected.	Test Passed.

Health Module

Table 6.6 Test Case Table for Health Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Add Health Record	Fill all the fields: Meals, Water Intake,	Health log saved with a success	As expected.	Test Passed.

	Sleep Hours click “Save Log”.	message: “Health log saved successfully”.		
Add Meals	Fill the meals taken that day.	Meals recorded and updated in Firebase.	As expected.	Test Passed.
Add Meals (voice record)	Fill the meals taken that day by voice recording.	Meals are recorded in mp3 format and updated in Firebase.	As expected.	Test Passed.
Add Meals (image)	Fill the meals taken that day by input with image.	Meals are saved as image and updated in Firebase.	As expected.	Test Passed.
Add Water Intake	Click “Add Glass” button.	Water count increases and updated in Firebase.	As expected.	Test Passed.
Reset Water Intake	Click “Reset” button.	Water count resets and updated in Firebase.	As expected.	Test Passed.
Add Sleep Hours	Select the hours of slept.	Sleep hours recorded and updated in Firebase.	As expected.	Test Passed.
Edit health log	Load a record by selecting the specific date. Modify data and	Updated successfully. Changes are	As expected.	Test Passed.

	click “Save Log” to update the record.	updated in Firebase.		
Delete health log	Click “Delete Record” Button.	Record removed from Firebase.	As expected.	Test Passed.

Profile Module

Table 6.7 Test Case Table for Profile Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Add profile details	Fill all the fields: Name, Age, Gender, Height, Weight and click “Save Changes”.	Profile detailed saved and updated in Firebase.	As expected.	Test Passed.
Any Profile Empty Field	Any empty field.	“Please enter a valid xxx” toast.	As expected.	Test Passed.
Edit profile	Update profile details and click “Save Changes” to update the record in Firebase.	Updated successfully with success message: “Profile updated successfully”. Changes are updated in Firebase.	As expected.	Test Passed.

Emergency Contact Module

Table 6.8 Test Case Table for Emergency Contact Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Add emergency contact	Fill all the fields: Name, Phone number, Relationship and click “Save”.	Emergency contact saved with success message: “Emergency contact has been added” and updated in Firebase.	As expected.	Test Passed.
Any Emergency Contact Empty Field	Any empty field.	“Please enter the contact’s xxx” toast.	As expected.	Test Passed.
Edit emergency contact	Update emergency contact details and click “Update Contact” to update the record in Firebase.	Updated successfully with success message: “Emergency contact has been updated”. Changes are updated in Firebase.	As expected.	Test Passed.
Delete contact	Click on “Delete” icon	Emergency Contact removed from Firebase.	As expected.	Test Passed.

SOS Module

Table 6.9 Test Case Table for SOS Module

Test Case	Input	Expected Output	Actual Output	Action Taken
Trigger SOS (999)	Press SOS button	Emergency phone call to 999.	As expected.	Test Passed.
Call emergency	Select any saved emergency contact	Call initiated.	As expected.	Test Passed.

6.2 Project Challenges

In the development of the Fitness and Health Application for Elderly, there were various challenges faced during the project. One of the main problems is the late realization that the speech-to-text feature is limited and does not function in Expo Go version SDK 54. The idea behind this feature was to assist older adults by allowing them to use voice commands for recording health data instead of typing, making the process more accessible. Given this was identified towards the end of the project, it was not possible to investigate and implement other options such as using third-party APIs or employing a different development process. As a result, speech-to-text was not implemented in the final version of the system, which marginally impacted the accessibility of the app and underlines the need for technical feasibility studies in the early stages of development.

Another significant challenge was the creation of the convenient and easy to use user interface when combining various features like medical reminders, physical activity instructions, emergency call options and health tracker. It would take several revisions of the design and some extra considerations of usability, including the enlargement of buttons, increasing color contrast and minimizing the complexity of the screen, to ensure that every feature was simple to use and particularly among users with low levels of digital literacy.

The other significant issue was the establishment of the backend logic provisions of reminders, notifications and storage of health data. Moving on to the use of credible medication reminders and making sure that the information was properly matched in various pages required a lot of testing time. Also, the implementation of the real-time SOS features and emergency contacts needed to be planned properly to prevent false triggering and at the same time making sure that in the case of a real emergency the response would be timely. These features have yet to be optimized by further exploration and have to be made to perform smoothly on all devices.

6.3 Objective Evaluation

The objective of this project was to design and develop a Fitness and Health Application for Elderly that is easy to use, practical and can help elderly individuals with their daily health-related tasks. The project has met its goals, with some caveats, according to the development and testing process.

Firstly, the app has achieved this objective through the design of an accessible and easy-to-use interface for the elderly. Increased font size, high contrast colors, big buttons and icons enhance legibility and user interaction, especially for visually impaired users. The interface has a simple structure that reduces the number of steps needed to perform a task, accommodating for those with limited motor ability. Besides, the aim to incorporate basic health features was met. It enables users to log on to critical health information such as meals, water and sleep hours. The results of the records will be displayed in a visible and easy-to-understand bar chart. This allows users to track their health regularly, leading to increased awareness and improved health.

Moreover, the solution includes key support and safety features, most specifically the SOS emergency button, allowing users to call for urgent help if needed. This helps instill confidence and a sense of security, and offers immediate help, which is one of the main barriers faced by older adults in using digital health apps. The availability of this feature increases the perceived security and trust of the system. The marketable outcome for this goal can be measured by the responsiveness of the system, accessibility of the SOS feature and user feedback on perceived safety while interacting with the system. Therefore, the system achieves its goal as a supportive and safe health management system.

Next, instead of mirroring typical fitness apps focused on competitive aspects like leaderboards and "streaks", this system follows a more supportive and positive approach aimed at the elderly population. Elements like subtle reminders, basic progress indicators and low-impact badges have been incorporated into the system to encourage positive reinforcement while avoiding frustration or demotivation. This goal can be measured by the degree of user engagement and the motivation feedback given by users. The app does not overwhelm the user with a gamified approach but rather encourages them through positive reinforcement to develop long-term behavior change and lead a healthier lifestyle.

Finally, the system has accomplished the three goals by providing an accessible, safe and supportive fitness and health system specifically for the elderly. The design choices and features of the system collectively support better usability, increased trust, and promote long-term engagement. The next step in evaluation, involving testing and gathering feedback from actual users, can help confirm these results and inform future developments.

6.4 System Evaluation

The evaluation of the application was conducted with 10 participants, all of whom were elderly and aged above 60. The questionnaire consisted of 6 sections: Ease of Use & Simplicity, Learnability, Navigation & Interface, Feature Usefulness, Confidence & Satisfaction and System Complexity (Reverse Questions). This evaluation will be using System Usability Scale (SUS) and will be printed on paper to ensure the elderly can take the evaluation easily.

Section A: Ease of Use

1. I think this application is easy to use.

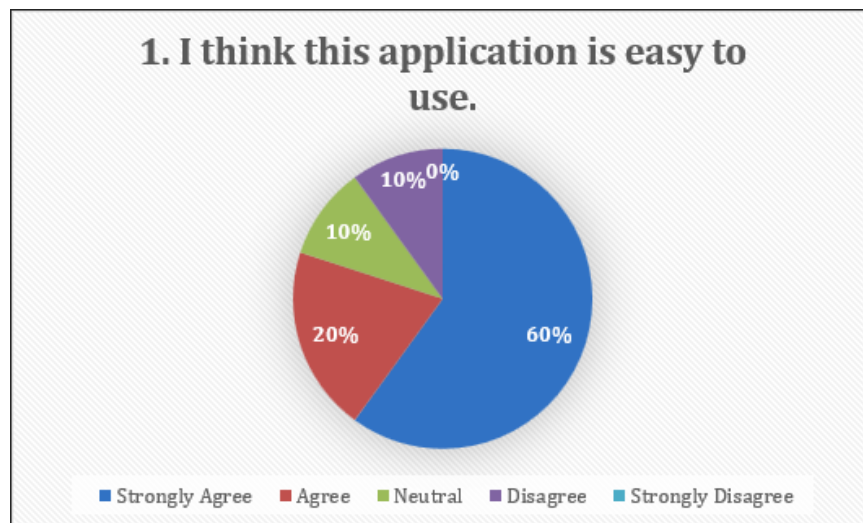


Figure 6.1 Result of Question 1

2. I feel confident using this application by myself.

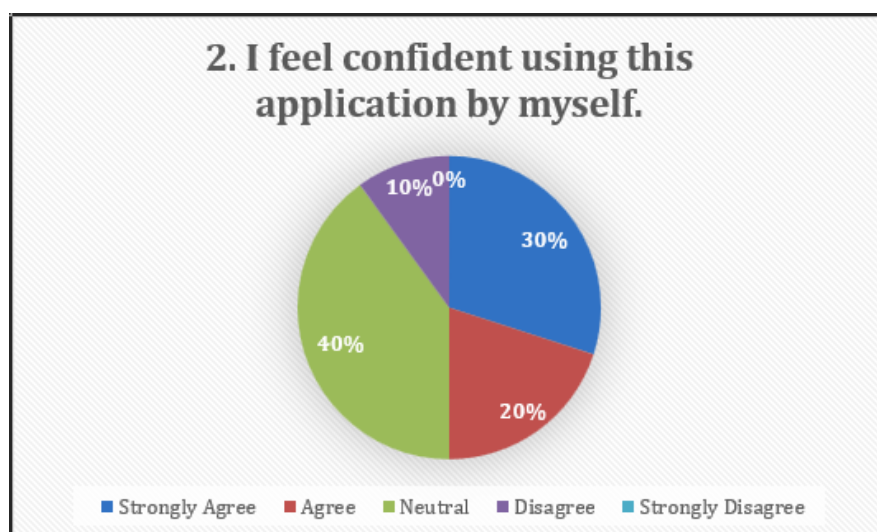


Figure 6.2 Result of Question 2

3. The steps in the application are simple and clear.

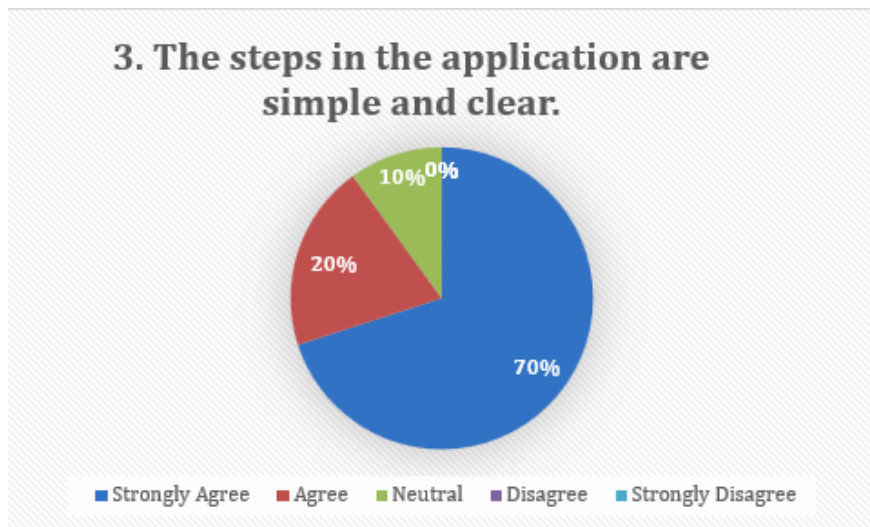


Figure 6.3 Result of Question 3

4. I can use the app without needing help from others.

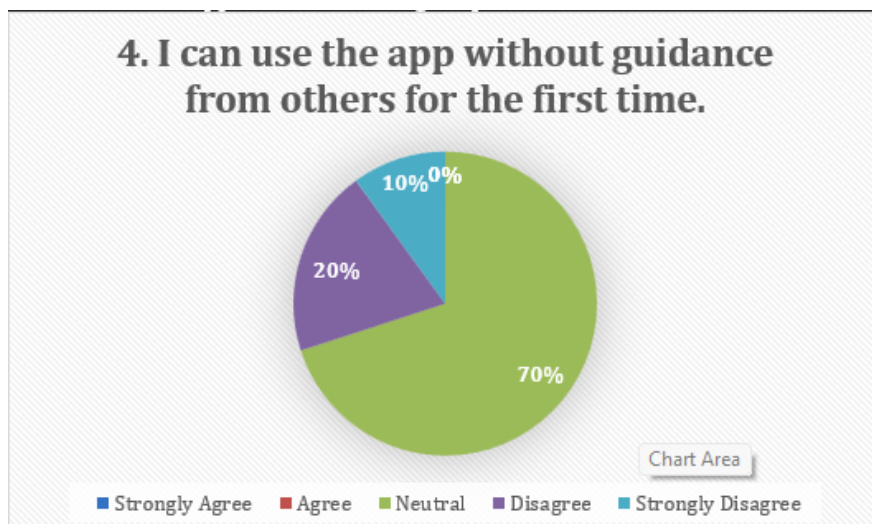


Figure 6.4 Result of Question 4

The ease of use data gathered in Section A shows how the elderly react when they first interact with the application. The results show that 60% of elderly strongly agree that this application is easy to use and 70% of them think that the steps in the application are simple and clear. But, only 30% of the elderly strongly agree that they have confidence to use the application by themselves. Besides, none of the elderly strongly agree or agree that they can use the application without guidance from others for the first time. As a small conclusion for this section, we can clearly understand that even most of the elderly have started to use mobile phones but it is still difficult to let them learn a new application.

Section B: Learnability

5. I learned to use the application quickly.

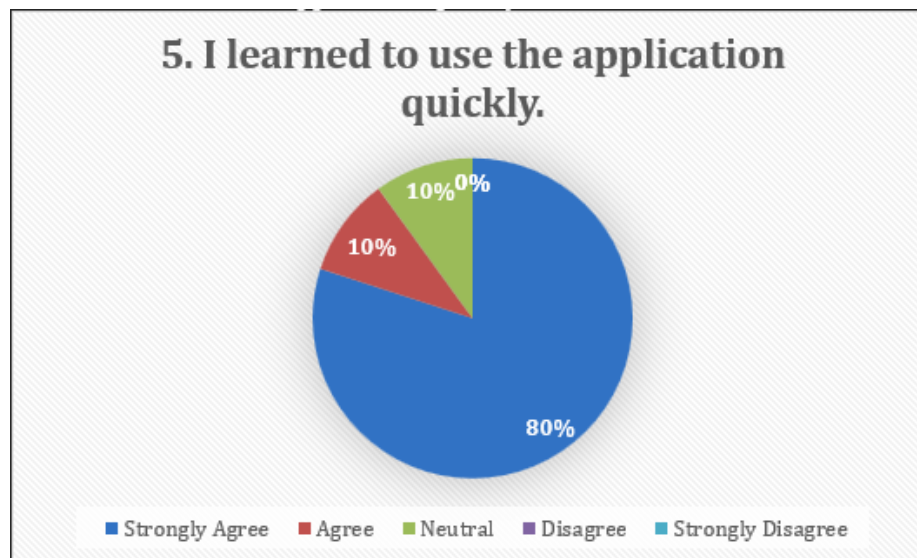


Figure 6.5 Result of Question 5

6. The features and instructions are easy to understand.

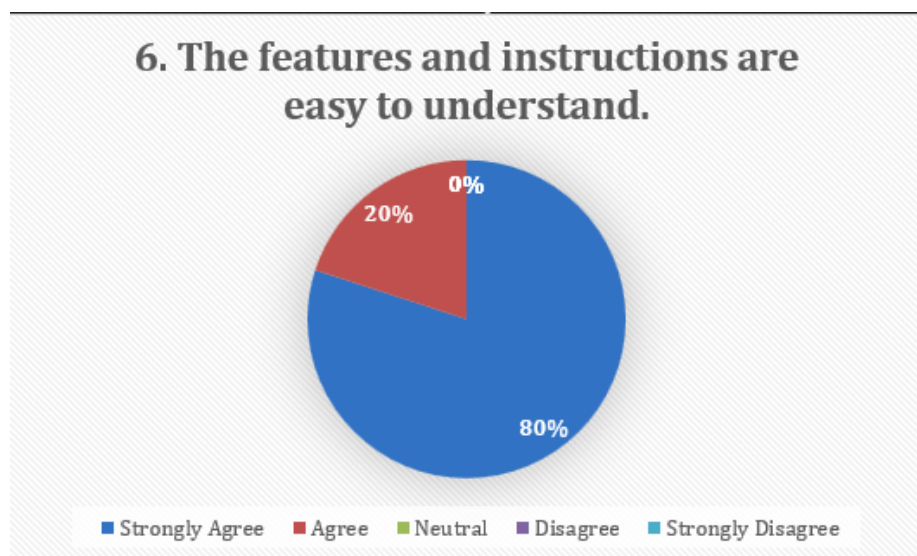


Figure 6.6 Result of Question 6

7. The icons, buttons, and text are clear and readable.

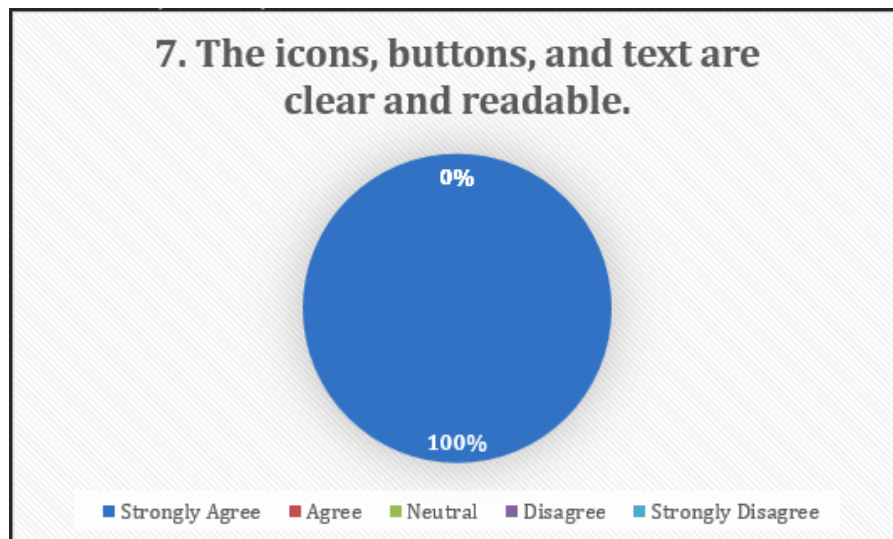


Figure 6.7 Result of Question 7

The learnability evaluation assessed how the application met the needs of the elderly. Feedback indicated strong user reflection as shown that 80% of the elderly strongly agree to they are able to learn this application quickly and the features and instructions included in the application are easy to understand. Not only that, all of the 10 elderly react that the icons, buttons and text are clear and readable. The result of the evaluation clearly shows that the application has successfully met the first objective which is to develop a fitness and health app with an accessible and user-friendly interface, they can learn fast and the large icons, button and text have solved the issues of vision issues.

Section C: Navigation & Interface

8. I can easily find what I need in the application.

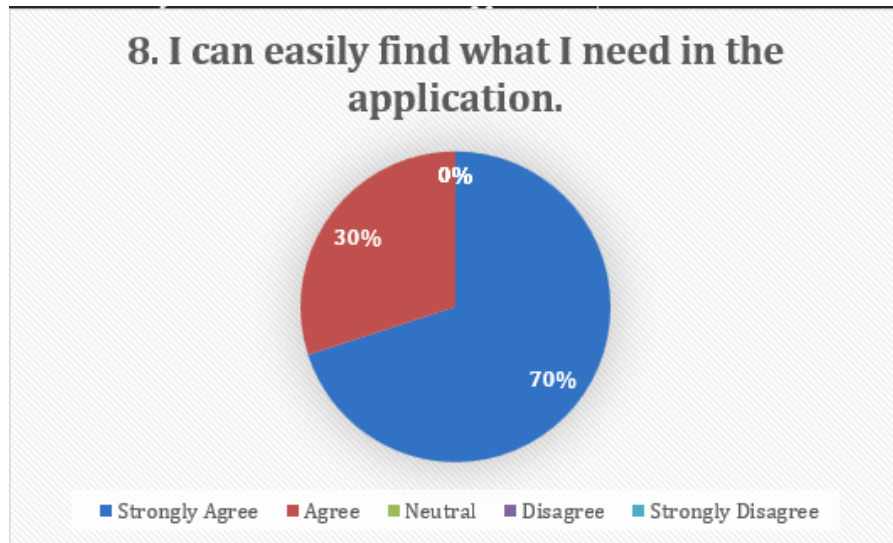


Figure 6.8 Result of Question 8

9. The layout of the app is simple and not confusing.

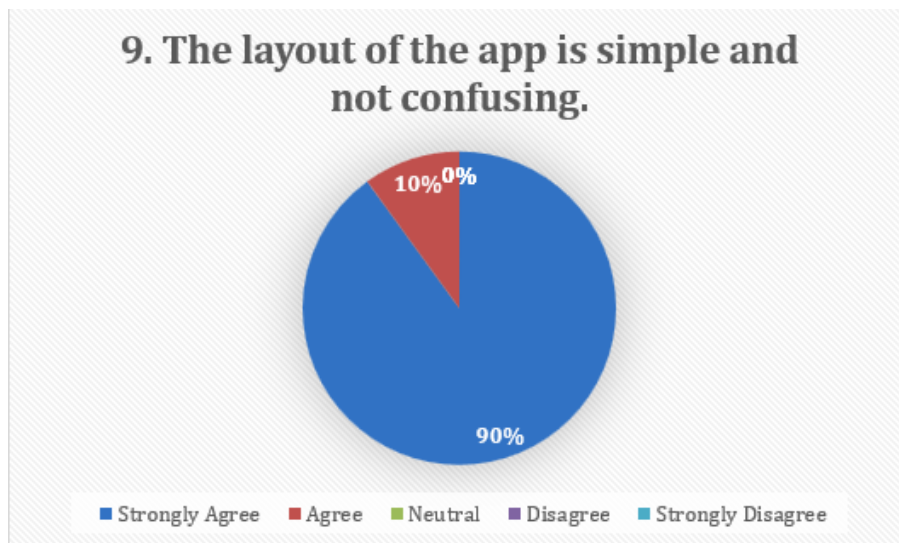


Figure 6.9 Result of Question 9

10. The font size and design are comfortable for me to see.

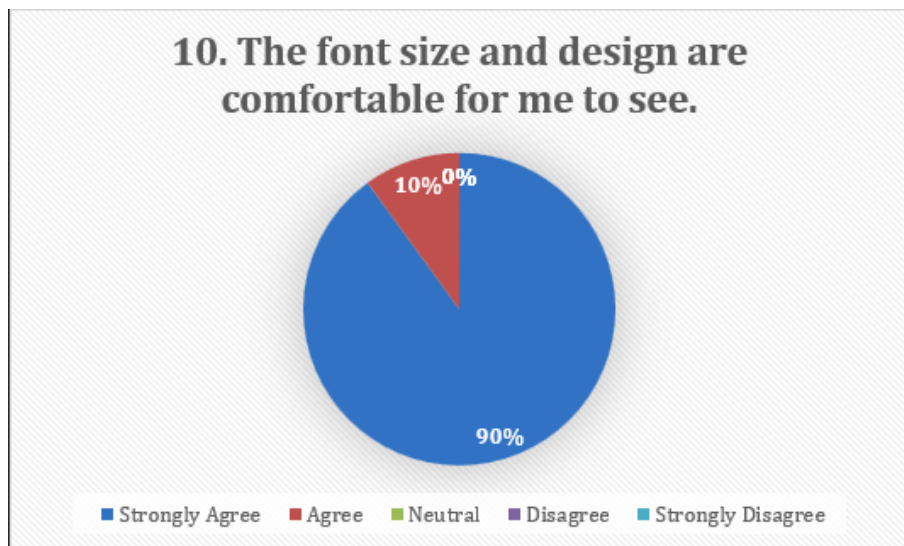


Figure 6.10 Result of Question 10

11. The bar chart (water, sleep) is good for me to understand.

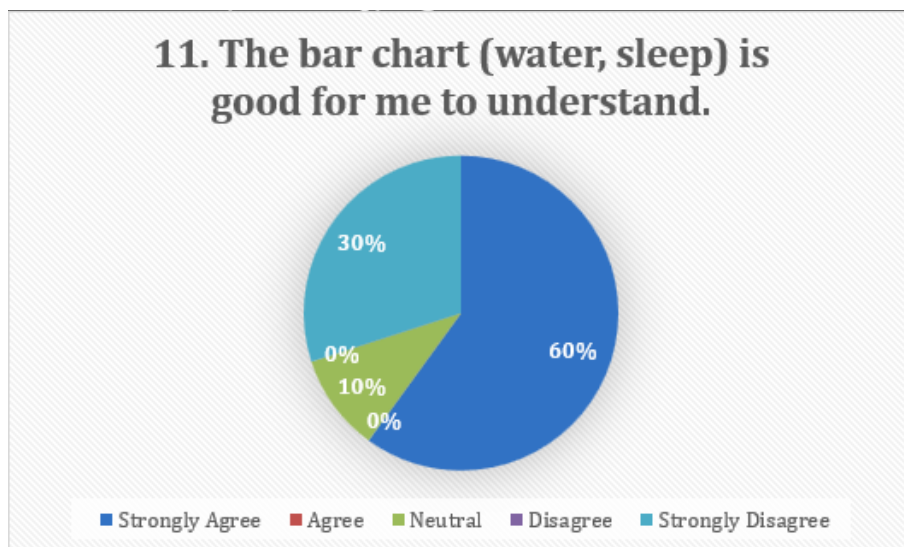


Figure 6.11 Result of Question 11

Based on the navigation and interface evaluation, the result shows that the elderly are actually satisfied with the fitness and health application for elderly user interface. 70% of the elderly strongly agree that they can easily find what they need in the application after they test it. 90% of the elderly strongly agree that the layout of the application is simple and not confusing and the font size and design are comfortable to see. Last but not least, 60% of the elderly strongly agree that the bar chart that displaying their water intake and sleep hours can make them understand easily. The overall result in this section reflects that the application has successfully met the first objective, which is to develop a fitness and health app with an accessible and user-friendly interface.

Section D: Feature Usefulness

12. The medication reminder feature is helpful to me.

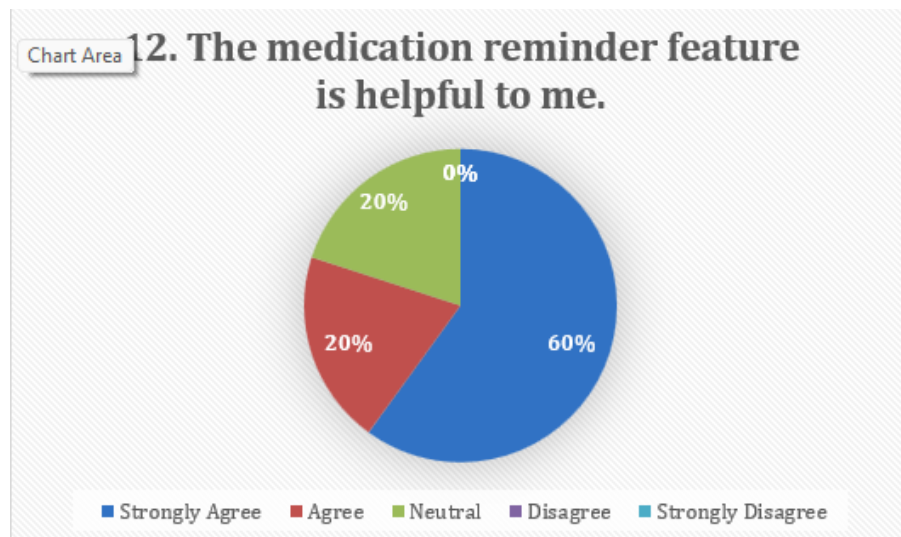


Figure 6.12 Result of Question 12

13. Health tracking (water, sleep, meals) is useful.

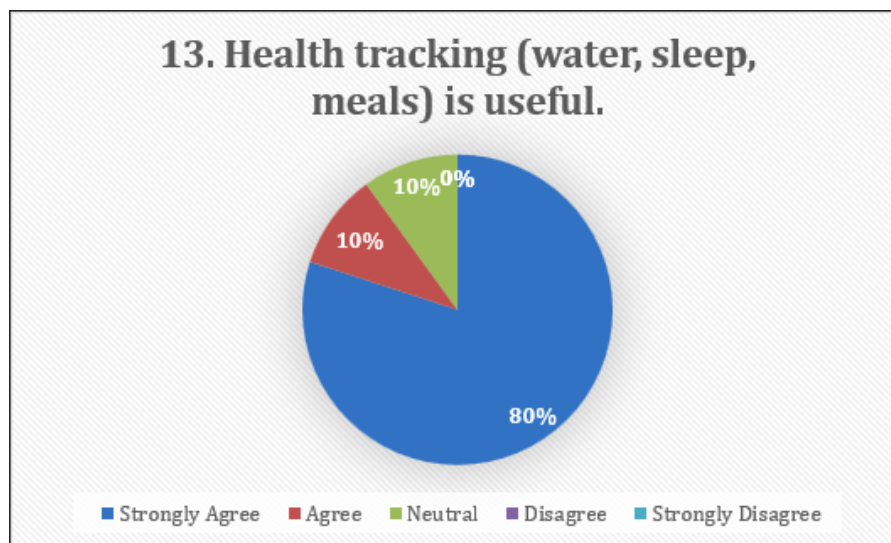


Figure 6.13 Result of Question 13

14. The image input and voice recording function is useful.

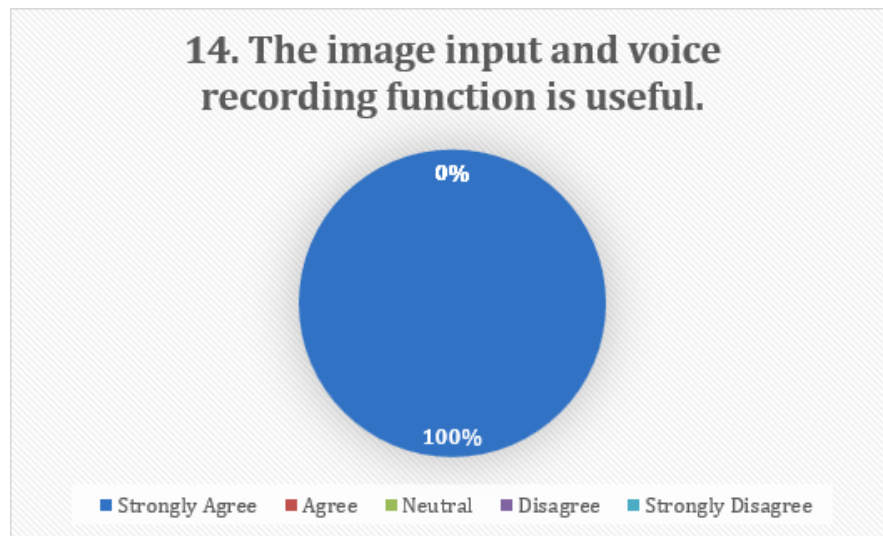


Figure 6.14 Result of Question 14

15. The exercise videos are easy to follow.

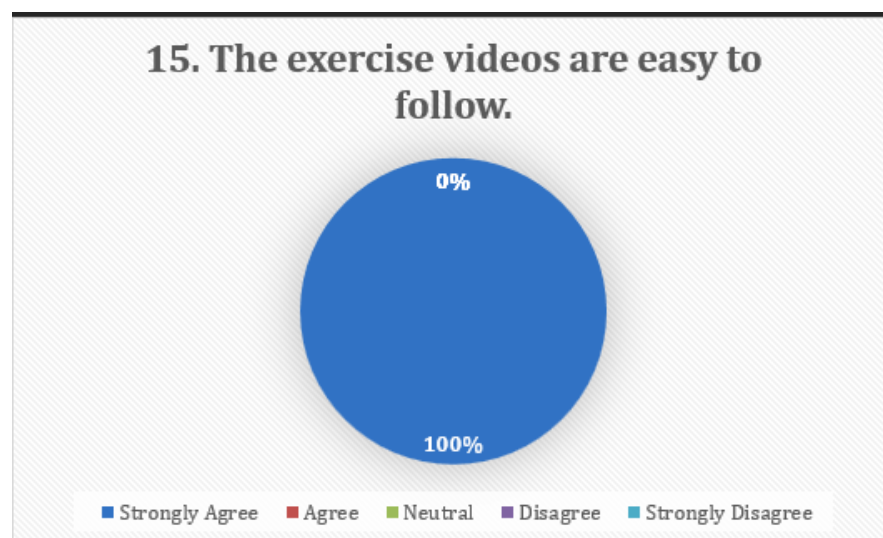


Figure 6.15 Result of Question 15

16. The SOS/emergency button makes me feel safer.

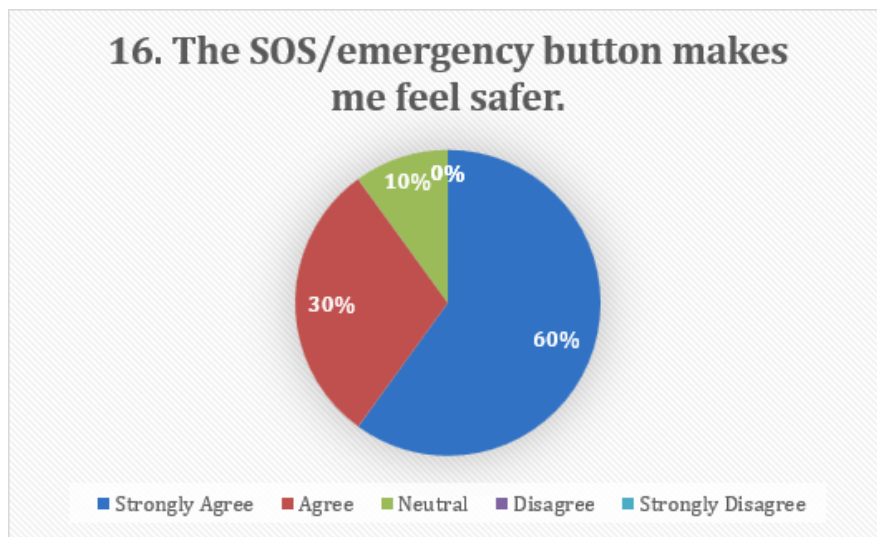


Figure 6.16 Result of Question 16

Based on the features usefulness evaluation, the application has delivered 4 mains features which are medication reminder, health tracking, exercise library and the SOS emergency feature. After they use the application, 60% of the elderly strongly agree that the medication reminder feature is helpful to them, it able to remind the elderly to take their medicine on time. Then, 80% of the elderly strongly agree that health tracking is useful, it can ensure the elderly record everything they eat, the daily water intake and sleep hours to help them manage their healthy lifestyle. 100% of the elderly strongly agree that voice recording and image input function are useful to them to prevent them from typing that could really trouble. Besides, 100% of the elderly strongly agree that the exercise videos are easy for them to follow, all the exercise videos are filtered with the safest and easiest so the majority of elderly can follow and perform it. Lastly, the SOS emergency button makes 60% of the elderly strongly agree that they feel safer when they are using this application. Overall, the features are actually friendly and beneficial to elderly users. With positive feedback from the evaluation, I believe the features could help the elderly like to engage more with the application.

Section E: Confidence & Satisfaction

17. I would like to use this application frequently.

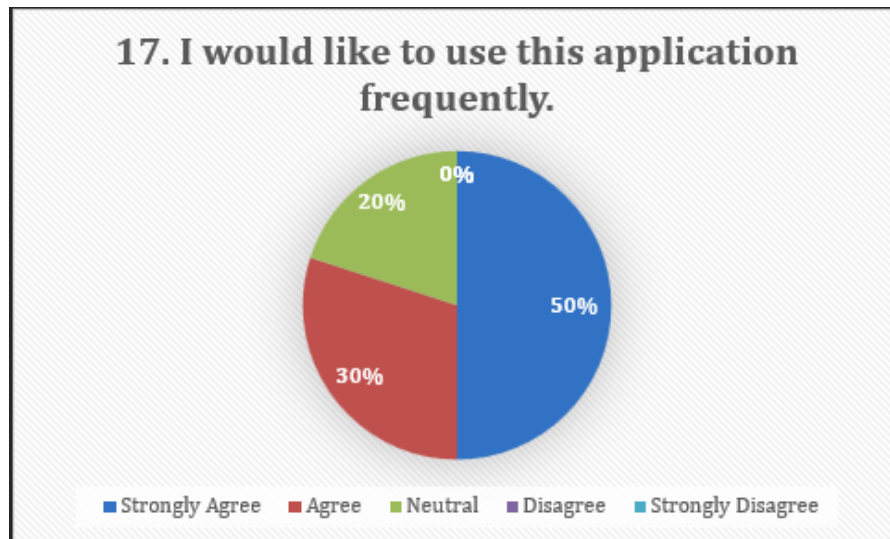


Figure 6.17 Result of Question 17

18. I would recommend this application to other elderly people.

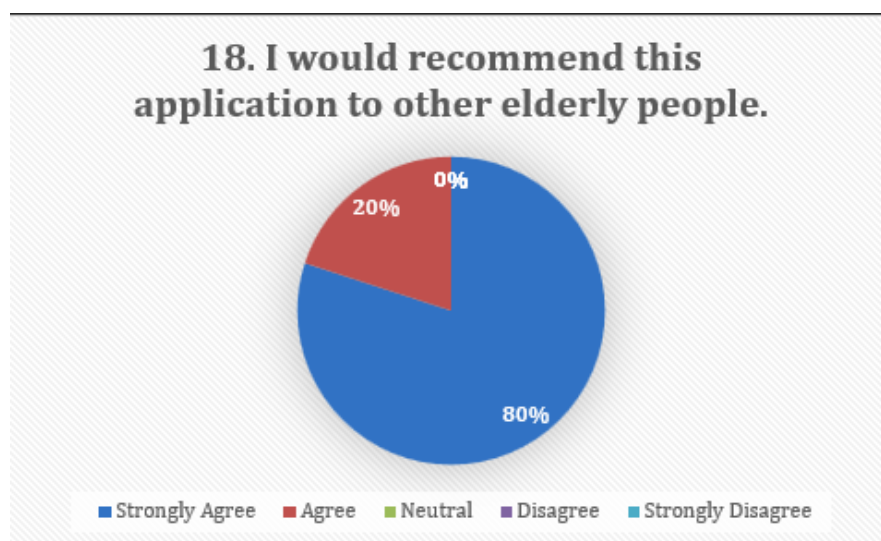


Figure 6.18 Result of Question 18

From the results of question 17 and 18, it indicates a strong positive user perception of the fitness and health application for elderly. 50% of the elderly strongly agree that they would like to use this application frequently with no negative responses recorded. Then, 80% of the respondents strongly agree that they will recommend this application to other elderly people. This reflects a high level of satisfaction and trust in the application and how the effectiveness and suitability to the target elderly population.

F. System Complexity (Reverse Questions)

19. I found the application unnecessarily complex.

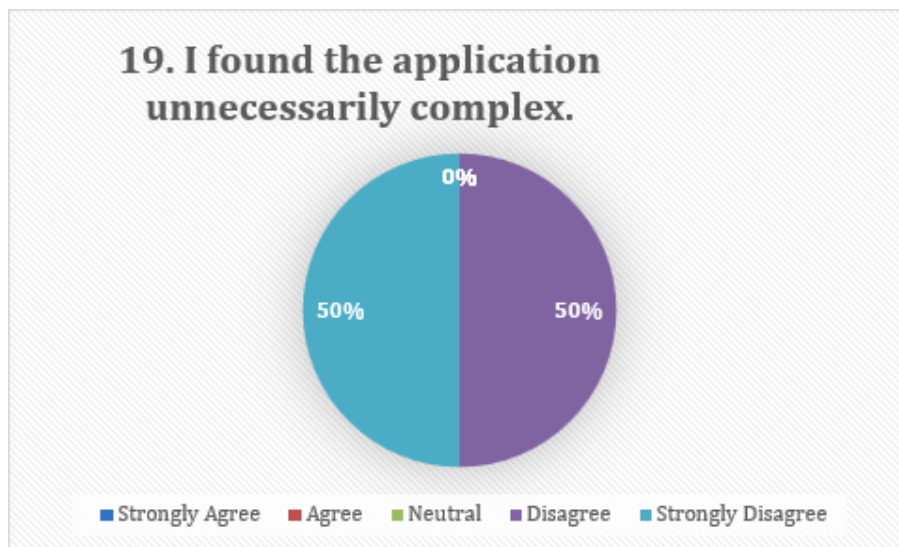


Figure 6.19 Result of Question 19

20. I needed technical support to use this app.

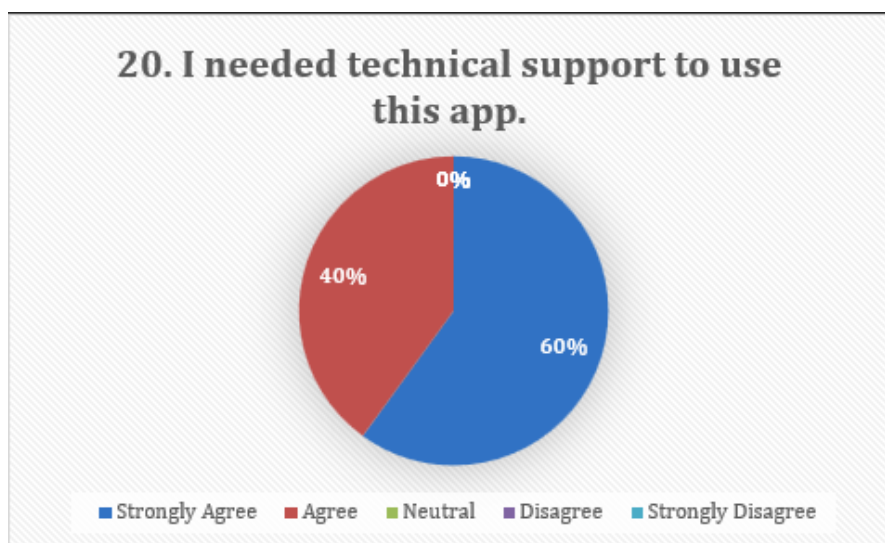


Figure 6.20 Result of Question 20

Elderly feedback from question 19 and 20 shows that the elderly are still struggling to learn a new application and requiring assistance. Even the elderly disagree with the application that is unnecessary complex but they still need technical support to use the application. These findings show that mobile applications are still new to elderly users. Even though many elderly individuals have started to interact with mobile phones, there is still time needed for them to adapt to this evolving technological trend.

6.5 Concluding Remark

In conclusion, this chapter has discussed the evaluation of the proposed Fitness and Health Application for Elderly. By conducting rigorous testing, evaluating performance characteristics, and assessing user-oriented aspects, the system's success in achieving its goals has been evaluated. The evaluation findings demonstrate the system's stability and performance in fulfilling its primary functions of health monitoring, medication reminder, exercise support and emergency assistance.

Moreover, the assessment shows that the system effectively overcomes previously identified challenges, especially regarding the usability, accessibility, and security for the elderly user. The use of a straightforward user interface, large icons and easy navigation has also led to better user satisfaction and acceptance among the elderly population. Moreover, the caregiver support and SOS features improve user trust and provide added security.

However, there were some challenges during the development and testing phases, including data accuracy, system performance, and design features that address the varying needs of the elderly population. These issues offered lessons and opportunities for enhancement and highlight the need for an iterative approach in user-centered system development.

Overall, the results presented in this chapter confirm that the developed system has met its goals and exhibits potential to be an effective digital health system for older adults. The assessment not only confirms the success of system design and development but also provides a platform for future development and research in this area.

Chapter 7

Conclusion and Recommendation

7.1 Conclusion

As a conclusion, this project has successfully designed and developed a Fitness and Health Application for the elderly to overcome the problems found in current apps. The research started by identifying the lack of accessibility, safety and appropriate motivation strategies in existing fitness applications. These problems informed us of a user-focused approach that prioritizes simplicity, safety and sustainability.

By embracing the User-Centered Design (UCD) and iterative development model, the application is developed with features including large text, easy navigation, reminder of medication, health monitoring, exercise instruction and SOS button. Firebase and mobile technologies were incorporated to maintain data consistency, authenticate users and deliver optimal system performance.

Besides, The evaluation results from the elderly participants showed the application is effective and achieves its goals. It helps us understand the elderly user friendly interface, safety features through emergency assistance, medication reminders, health logs and the exercise library have satisfied the elderly users. In conclusion, the system is a useful and meaningful digital tool that helps elderly users adopt a healthier lifestyle, enhances their independence and fosters communication with their loved ones.

This work not only advances the development of mobile health apps but also lays the groundwork for further research and development of digital solutions targeting the elderly.

7.2 Recommendation

While the system proposed in this paper has met its goals, there are some possible changes and upgrades that can be made in the future.

Firstly, the application can be improved by adding support for wearable devices like smartwatches. This will enable automatic monitoring of health indicators like heart rate, step count and sleep quality and enhance the system's accuracy and ease of use for elderly.

Secondly, we can add AI-powered personalization to offer more personalized exercise and health advice according to the health status and behaviors of elderly. This will also enhance user engagement and success of the application.

Thirdly, future iterations of the system can include multi-language features to reach out to elderly users from various language backgrounds, particularly in a diverse culture such as Malaysia. Voice-to-text features can also be improved to offer an easier way to do inputting and convenient user interface.

Finally, caregiver support can be further enhanced by adding real-time health monitoring dashboards and alerts, enabling family members or health professionals to remotely monitor the user's health and take immediate action in case of need.

Finally, more extensive testing with a larger and more representative sample of elderly users is encouraged to obtain more feedback. This would serve as valuable feedback to improve system design and ensure it caters to diverse user needs and preferences.

In conclusion, although the existing system presents a solid concept, by continuously improving and integrating technologies, the system will be more effective, scalable and impactful in elderly health care.

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Note: Refer to UTAR library IEEE style referencing source for more detail.

https://opac.utar.edu.my/gw_2013_2_8/html/default/en/Guides/IEEE-Reference-Guide-Online-v.04-20-2021.pdf

Or see the attachment pdf file “Appendix D – IEEE style referencing”

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Code Sample

```
import React, { useState, useEffect } from "react";
import {
  View,
  StyleSheet,
  ScrollView,
  Alert,
} from "react-native";
import { Text } from "react-native-rapi-ui";
import { useNavigation, useRoute } from "@react-navigation/native";
import { LargeButton } from "../components/ui/LargeButton";
import { LargeTextInput } from "../components/ui/LargeTextInput";
import { TopNavigationBar } from "../components/ui/TopNavigationBar";
import { ElderlyTheme } from "../constants/theme";
import { useHealthData } from "../provider/HealthDataProvider";
import { EmergencyContact as EmergencyContactType } from "../utils/storage";

const EmergencyContact = () => {
  const navigation = useNavigation<any>();
  const route = useRoute<any>();
  const { emergencyContacts, updateEmergencyContacts } = useHealthData();

  const contactIndex = route.params?.contactIndex;
  const isEditing = contactIndex !== undefined;

  const [name, setName] = useState("");
  const [phone, setPhone] = useState("");
  const [relationship, setRelationship] = useState("");
  const [loading, setLoading] = useState(false);

  useEffect(() => {
    if (isEditing && route.params?.contact) {
```

```

    const contact = route.params.contact;
    setName(contact.name || "");
    setPhone(contact.phone || "");
    setRelationship(contact.relationship || "");
  }
}, [isEditing, route.params]);

const validate = (): boolean => {
  if (!name.trim()) {
    Alert.alert("Validation Error", "Please enter the contact name");
    return false;
  }
  if (!phone.trim()) {
    Alert.alert("Validation Error", "Please enter the contact number");
    return false;
  }
  // Basic phone validation - just check if it has some digits
  const phoneDigits = phone.replace(/\D/g, "");
  if (phoneDigits.length < 7) {
    Alert.alert("Validation Error", "Please enter a valid phone number");
    return false;
  }
  if (!relationship.trim()) {
    Alert.alert("Validation Error", "Please enter the relationship");
    return false;
  }
  return true;
};

const handleSave = async () => {
  if (!validate()) return;

```

```

setLoading(true);
try {
  const contact: EmergencyContactType = {
    name: name.trim(),
    phone: phone.trim(),
    relationship: relationship.trim(),
  };

  if (isEditing && contactIndex !== undefined) {
    // Update existing contact
    const updated = [...emergencyContacts];
    updated[contactIndex] = contact;
    await updateEmergencyContacts(updated);
    Alert.alert("Success", "Emergency contact updated successfully!", [
      { text: "OK", onPress: () => navigation.goBack() },
    ]);
  } else {
    // Add new contact
    await updateEmergencyContacts([...emergencyContacts, contact]);
    Alert.alert("Success", "Emergency contact added successfully!", [
      { text: "OK", onPress: () => navigation.goBack() },
    ]);
  }
} catch (error) {
  Alert.alert("Error", `Failed to ${isEditing ? "update" : "add"} emergency contact. Please
try again.`);
} finally {
  setLoading(false);
}
};

return (

```

```

<View style={styles.container}>
  <TopNavigationBar />
  <ScrollView
    style={styles.scrollView}
    contentContainerStyle={styles.contentContainer}
    keyboardShouldPersistTaps="handled"
  >
    <View style={styles.form}>
      <LargeTextInput
        label="Emergency Contact Name *"
        value={name}
        onChangeText={setName}
        placeholder="Enter contact name"
        autoCapitalize="words"
      />

      <LargeTextInput
        label="Contact Number *"
        value={phone}
        onChangeText={setPhone}
        placeholder="Enter phone number"
        keyboardType="phone-pad"
      />

      <LargeTextInput
        label="Relationship *"
        value={relationship}
        onChangeText={setRelationship}
        placeholder="e.g., Son, Daughter, Friend"
        autoCapitalize="words"
      />
    </View>
  </View>

```

```

<View style={styles.buttonContainer}>
  <LargeButton
    title={isEditing ? "Update Contact" : "Save Contact"}
    onPress={handleSave}
    disabled={loading}
    variant="primary"
  />
  <View style={styles.spacing} />
  <LargeButton
    title="Cancel"
    onPress={() => navigation.goBack()}
    variant="secondary"
  />
</View>
</ScrollView>
</View>
);
};

```

```

const styles = StyleSheet.create({
  container: {
    flex: 1,
    backgroundColor: ElderlyTheme.colors.background,
  },
  scrollView: {
    flex: 1,
  },
  contentContainer: {
    padding: ElderlyTheme.spacing.lg,
    paddingTop: ElderlyTheme.spacing.md,
  },
});

```

```
form: {
  marginBottom: ElderlyTheme.spacing.xl,
},
buttonContainer: {
  width: "100%",
  marginBottom: ElderlyTheme.spacing.xl,
},
spacing: {
  height: ElderlyTheme.spacing.md,
},
});

export default EmergencyContact;
```




FITNESS & HEALTH APPLICATION FOR ELDERLY



INTRODUCTION

A simple, safe, easy navigation and UI of fitness and health application that suit elderly.



OBJETIVES

- To develop a fitness and health app with an accessible and user-friendly interface.
- To integrate comprehensive support and safety features into fitness and health applications.
- To implement motivational strategies that are age-appropriate and supportive rather than competitive.

PROPOSED METHODS

- This project uses the Prototyping Model, where planning, analysis, design, development and testing are repeated until the app meets elderly users' needs. The system layout is designed and core features are developed using Expo and Firebase. Continuous testing and feedback guide each refinement cycle, resulting in a simple and user-friendly fitness and health application for the elderly.



CONCLUSION



The Fitness and Health Application for Elderly provides a simple, safe and supportive digital tool that addresses common issues in existing apps. With features like reminders, guided activities, health tracking and an SOS buttons support seniors manage their health more independently.

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Survey Questionnaire

System Usability Scale (SUS) Questionnaire for Elderly Users

No.	Statement	1	2	3	4	5
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A. Ease of Use & Simplicity						
1	I think this application is easy to use.	☐	☐	☐	☐	☐
2	I feel confident using this application by myself.	☐	☐	☐	☐	☐
3	The steps in the application are simple and clear.	☐	☐	☐	☐	☐
4	I can use the app without guidance from others for the first time.	☐	☐	☐	☐	☐
B. Learnability						
5	I learned to use the application quickly.	☐	☐	☐	☐	☐
6	The features are easy to understand.	☐	☐	☐	☐	☐
7	The icons, buttons, and text are clear and readable.	☐	☐	☐	☐	☐

C. Navigation & Interface

8	I can easily find what I need in the application.	☐	☐	☐	☐	☐
9	The layout of the app is simple and not confusing.	☐	☐	☐	☐	☐
10	The font size and design are comfortable for me to see.	☐	☐	☐	☐	☐
11	The bar chart (water, sleep) is good for me to understand.	☐	☐	☐	☐	☐

D. Feature Usefulness

12	The medication reminder feature is helpful to me.	☐	☐	☐	☐	☐
13	Health tracking (water, sleep, meals) is useful.	☐	☐	☐	☐	☐
14	The image input and voice recording function is useful.	☐	☐	☐	☐	☐
15	The exercise videos are easy to follow.	☐	☐	☐	☐	☐
16	The SOS/emergency button makes me feel safer.	☐	☐	☐	☐	☐

**E. Confidence
& Satisfaction**

- 17 I would like to use this application frequently. ☐ ☐ ☐ ☐ ☐
- 18 I would recommend this application to other elderly people. ☐ ☐ ☐ ☐ ☐

**F. System
Complexity
(Reverse
Questions)**

- 19 I found the application unnecessarily complex. ☐ ☐ ☐ ☐ ☐
- 20 I needed technical support to use this app. ☐ ☐ ☐ ☐ ☐