Journal of
Computer & Electrical and Electronics Engineering Sciences
Original Article
DOI: 10.51271/JCEEES-0013

Personalized special training follow-up application Cardiofit2

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Cite this article: Akbaba, B.E., Akpınarlı, E., Sarısoy, F., Yılmaz, B., Şenel, Ö., & Günay, M. (2024) Personalized special training follow-up application Cardiofit2. *J Comp Electr Electron Eng Sci*, 2(1), 25-30.

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Received: 06/03/2024 ◆ **Accepted**: 16/04/2024 ◆ **Published**: 27/04/2024

ABSTRACT

Mobile applications are preferred by many people due to the convenience they provide to users and their low cost. Mobile applications, which are widely used in many fields, also appear in many different forms in the field of fitness and health. Mobile application experts, who closely follow technological developments, update these applications periodically. Thus, with new training and nutrition recommendations provided to users, users are provided with easy access to technological developments as well as developments in sports. Mobile applications also aim to create a fitness and health routine for their users in daily life with the feedback they provide based on user preferences and motivating warnings to users. The fitness and health application we have developed called "Cardiofit2" also allows users to save their personal information and access personalized exercise programs created using this information. The application is designed to enable users to easily achieve their fitness goals with weekly exercise programs in the short and long term. It also aims to provide more comprehensive support to users with features such as exercise history, daily water consumption warnings, pedometer and smart watch integration. Cardiofit2 is an improvable platform that helps users gain healthy lifestyle habits with its aesthetic design and strong technical infrastructure. The application aims to guide users in achieving their fitness goals with its user-friendly interface, personalized exercise programs and health tracking features. It supports users' transition from a sedentary lifestyle to a healthier lifestyle with regular feedback and motivational alerts.

Keywords: Fitness, kotlin, firebase, mobile application

INTRODUCTION

Nowadays, increasing interest in a healthy lifestyle has increased the use of mobile applications. Mobile fitness applications offer strong support to individuals in setting, tracking and achieving personal health goals with the advantages offered by portable technology. For this reason, many people use fitness applications to improve their physical and mental health [Yu et al., 2021; Liu et al., 2016].

A number of innovative technologies in mobile fitness applications are also used to monitor general activity and physical conditions. In particular, there are many applications for weight loss and exercise tracking. As a result of the research, it was concluded that there are more than 30,000 health and fitness applications worldwide [Ahn et al., 2023]. These applications, which appeal to a wide user base, bring the world of fitness to mobile platforms, allowing individuals to increase their physical activity levels and take steps towards a healthy lifestyle [Yu et al., 2021; Liu et al., 2016].

Applications that focus especially on home-based exercises offer a suitable alternative for adults, providing positive behavioral development in the individual with the approach of using social cognitive theory and persuasive technology principles, and also support psychological mechanisms for users to maintain their exercise habits with home-based mobile applications [Voth et al., 2016; Khaghani-far et al., 2016; Nissen et al., 2022].

A study examining long-term use effects provides important insights into how users use fitness apps and why they stop using them [Herrmann et al., 2017]. In this context, ease of use, satisfaction, fitness success and social connection stand out among the factors that determine users' intention to continue using applications [Curralo et al., 2022; Jee, 2017].

SmartStep provides an important example of integrating the step counting feature in the project [Hegde et al., 2016; Voth et al., 2016]. SmartStep stands out with its ability to classify daily activities such as sitting, standing, walking and cycling with high accuracy. This feature inspired the integration of a similar step counting feature in the project in the context of tracking and analyzing the activities performed by users [Hegde et al., 2016].

On the other hand, a smart watch step counting application developed for adults also provides an important example that can be evaluated in the project [Folkvord et al, 2021; Yang et al., 2020; Chalmers et al., 2021; Bhargava et al., 2020]. This application includes a special step counting algorithm and has achieved successful results in young adults in laboratory studies and short-term field studies [Boateng et al., 2022].

Mobile fitness applications have a key role in helping individuals achieve their healthy life goals with their various features and design elements that appeal to a wide range of users [Zhang et al., 2020]. However, greater emphasis on user experience needs to be placed in the design of these applications, data collection methods need to be standardized, and strategies to encourage long-term use by users need to be developed [Philip et al., 2022; Germini et al., 2022]. In this regard, the closer interaction of fitness applications with their users and the provision of personalized services further contributes to increasing the use of these technologies [Higgins, 2015; Rockmann et al., 2019].

This study aims to contribute to individuals reaching their personal health goals more consciously and effectively by emphasizing the importance of mobile technology in the field of health and fitness. The exercise program of the application has been prepared by sports scientists who are experts in the field. In addition, Cardiofit2 was inspired by the studies carried out in the field during the development phase of the application, ensuring that it is a user-friendly application.

METHODS

Kotlin programming language was used in addition to Firebase and Android Studio during the development process of the mobile fitness application.

Firebase's real-time database feature, users can instantly track their exercise levels and dynamically adjust their programs. Firebase's workout data and level management capabilities create a strong foundation for supporting users in reaching their fitness goals and creating personalized workout programs. This platform effectively stores users' preferred exercise types, set goals, and daily exercise times, providing a completely personalized exercise experience within the application.

Users can also integrate their smart watches into the application. Heart rate data, Firebase It works synchronously with the application through real-time database solutions such as Realtime Database or Cloud Firestore. In this way, users can see their heart rate changes while exercising or tracking their daily activities. Thanks to Firebase's powerful infrastructure, this data is stored and retrieved quickly, so users can access accurate and up-to-date information at any time. This heart rate data of the users is constantly updated and recorded within the application.

During the development process of the project, Kotlin language was preferred and Android Studio was used. Giraffe | Version 2022.3.1 was used. Kotlin is a programming language recommended and supported by Google, especially for Android application development. While this language incorporates the powerful features offered by Java, it also provides a more effective experience for developers by offering a more modern, expressive and error-proof structure.

The application, developed for mobile devices using the Kotlin language on Android Studio, had an efficient development process thanks to Kotlin's flexible structure and short code blocks. Since Kotlin is compatible with Java, it allows the use of existing Java libraries without any problems.

The Kotlin language in the development of the application that works compatible with smart watches has been an important factor, especially in terms of effectively processing the sensor data provided by smart watches. The extensive standard libraries in the Kotlin language and the nature of the language have enabled the performance of the smartwatch application to be increased and developed quickly.

Core KTX (1.7.0) is the library used to optimize the core functionality of the application and the interaction with the Android platform. It is compatible with projects written in Kotlin and has facilitated the development processes of the project.

AppCompat (1.6.0): Standardized the unit visibility and behavior of the application interface, providing a consistent experience across a wide range of devices.

Material Components (1.6.0): It is a library that provides UI components and style support in accordance with Google's Material Design guidelines. It has helped the application to have a modern and user-friendly interface.

Jetpack Compose (1.8.2): It is a framework that supports modern Android UI design Notified data changes automatically updated the UI, simplifying the development process and improving code readability.

Firebase Authentication: It is a library used for user authentication and management It was used to ensure secure authorization processes of users.

Firebase Firestore: Firebase, a real-time database It is a library that stores and syncs application data with Firestore. It was used to quickly synchronize application data between users.

Firebase Cloud Messaging (FCM): Used to make users interactive and send notifications on a daily basis.

Firebase UI (8.0.2) firebase It is a library for quickly creating UI components using Firestore . It was used to make it easier for users to interact with the database.

These libraries supported different aspects of the project and contributed to the application providing a strong user experience. The use of each library is chosen to meet the specific requirements of the project and optimize your development process. Various features offered by Firebase are seamlessly integrated in the Android Studio environment with the application written using the Kotlin language.

Kotlin, Firebase It works in harmony with features such as Authentication and Realtime Database, ensuring the security of user data and effective management of real-time updates. Modern features of the Kotlin language have made Firebase integration more readable and manageable.

Studio's advanced emulator support has been a great advantage in the process of testing applications developed using the Kotlin language in accordance with different screen sizes and device features. The expressive power provided by the Kotlin language has allowed tests on the emulator to be carried out more comprehensively and effectively. Using the Kotlin language reduced code duplication in the overall development process of the project, facilitated debugging processes, and made applications more readable and maintainable. These advantages of the Kotlin language, together with Android Studio, allowed the project to be implemented more efficiently. In this way, the development process progressed faster and eventually a mobile application emerged that offers users a more powerful and robust mobile experience.

Exercise Models Offered by the Mobile Application to Users

The exercise program page of the developed application at different loads represents a modular design that allows users to access and manage exercise programs within a certain period of time. These designs are programs that offer customized exercises that guide users to reach the optimal fitness level in a specified time.

The 12-Week Exercise Program provides users with a two-week adaptation at a lower load and includes a special RecyclerView to ensure optimal adaptation to exercise during this period and to get maximum efficiency from the planned exercise program.

In Figure 1: A first level tightening program is offered to users over the ideal weight, tailored to their resting heart rate and personal characteristics.

1.-2 . Weeks	3.-4. Weeks	5.-6.-7.-8. Weeks	9.-10.-11.12. Weeks
10 Dk Warm up Run 5 Dk Stretch Vo2 Max =%50-55 2 Days in a Week 400 Kcal /2 Target Time = 40dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %50-55 3 Days in a Week 600 Kcal /3 Target Time = 30 Dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %60-65 3 Days in a Week 900 Kcal /3 Target Time = 45 Dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %70-75 4 Days in a Week 1600 Kcal /4 Target Time = 60 Dk Colling Down 5 Dk

Figure 1. Level one exercise program

When planning the exercise program, appropriate heart rate ranges are automatically calculated by the program, taking into account the user's resting heart rate and age. When the smart watch exceeds or falls below these heart rate ranges, the smart watch gives an audible and vibrating warning and ensures that the user stays within the heart rate ranges calculated according to his personal characteristics. During the first two weeks of adaptation, users are helped to adapt to exercise with 200-kcal or 40 minutes of light-paced workouts two days a week. In weeks 3 and 4, users are expected to complete a 200-kcal exercise in 30 minutes. 5.6.7.8. During the following weeks, users are expected to complete a 300-kcal exercise in 45 minutes. 9.10.11.12. During the following weeks, users are expected to complete a 450-kcal exercise in 60 minutes. Each The exercise starts with a 10-minute warm-up run followed by 5 minutes of stretching movements. Exercises are completed with a 5-minute low-tempo cool-down run. 12 weeks old After the exercise period, the second level exercise program is unlocked for users, and users can continue the 8-week level 2 exercise program with the new calculated heart rate intervals.

8-Week Exercise Program: Users are expected to be at their ideal weight or have completed the first level exercise program. It aims to provide users with maximum efficiency in a shorter time with 8-week individually planned exercises.

In Figure 2: Users who are at their ideal weight or who have successfully completed the first level exercise program are offered an 8-week second level exercise program tailored to their resting heart rate and personal characteristics.

1.-2 . Weeks	3.-4. Weeks	5.-6. Weeks	7.-8. Weeks
10 Dk Warm up Run 5 Dk Stretch Vo2 Max =%50-55 3 Days in a Week 600 Kcal /3 Target Time = 30dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %50-55 4 Days in a Week 1000 Kcal /4 Target Time = 40 Dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %60-65 4 Days in a Week 1200 Kcal /4 Target Time = 45 Dk Colling Down 5 Dk	10 Dk Warm up Run 5 Dk Stretch Vo2 Max = %70-75 4 Days in a Week 1600 Kcal /4 Target Time = 60 Dk Colling Down 5 Dk

Figure 2. Second level exercise program

In the second level exercise program, the first 1.2 in the heart rate intervals calculated individually from the users. During the following weeks, users are expected to complete a 200-kcal exercise in 30 minutes, 3 days a week. In weeks 3 and 4, users are expected to complete a 250-kcal exercise in 40 minutes, 4 days a week. 5.6. During the following weeks, users are expected to complete a 300-kcal exercise in 45 minutes, 4 days a week. 7.8. During the following weeks, users are expected to complete a 400-kcal exercise in 60 minutes, 4 days a week. Each exercise begins with a 10-minute warm-up run followed by 5 minutes of stretching movements. Exercises are completed with a 5-minute low-tempo cool-down run.

In Figure 3: The flow diagram of the developed mobile application and the steps of the application such as registration, gender selection, physical characteristics, training target smart watch connection are presented in detail.

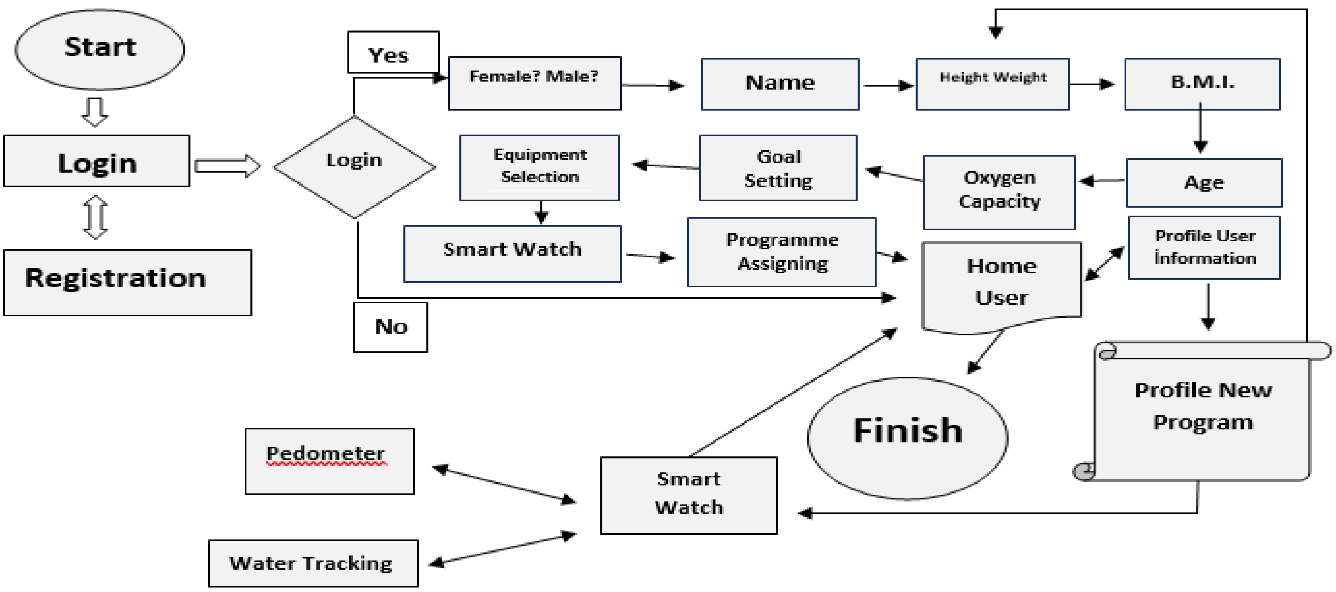

Figure 3. Cardiofit2 flow diagram

In Figure 4: After users download the mobile application from playstore, the user is greeted by the registration page. After the user registers to the mobile application with a personal e-mail, the mobile application asks the user to enter physical characteristics such as age, gender, height and weight. Based on the training goal chosen by the user, the sports equipment he owns and the information he has entered into the mobile application, a personalized exercise model and pulse ranges are determined for the user to achieve optimal efficiency. The user can then access the personalized exercise program when he/she logs in to the application with the e-mail he/she registered with. The mobile application also offers users the ability to view their exercise history, step counting and daily water tracking. The mobile application instantly retrieves users' heart rate data from Firebase via the integrated smart watch and reports it weekly as a graphic.

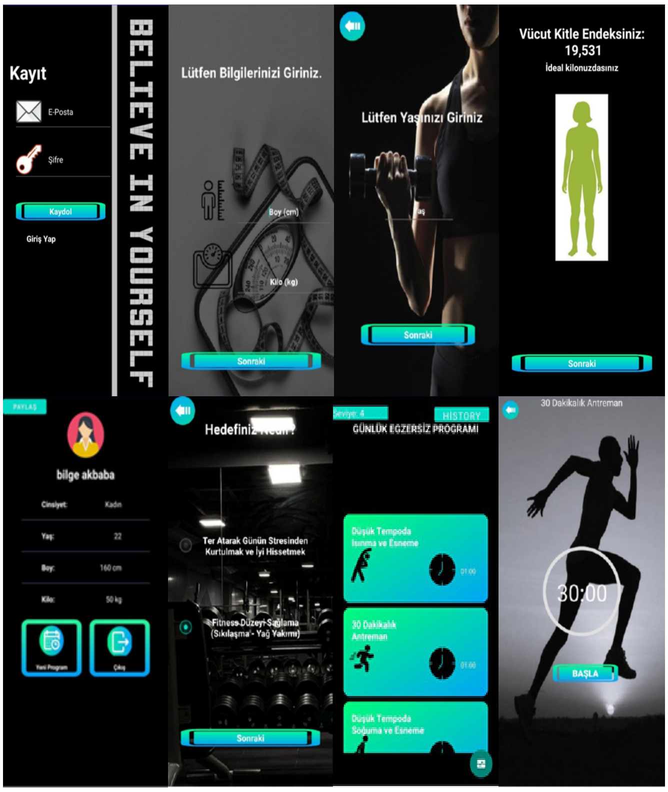

Figure 4. Registration page of the mobile application, personal information.

The mobile application aims to ensure that the user gets maximum efficiency from the exercise by giving vibrating and audible warnings when the pulse exceeds or falls below the range, so that the users stay within the individually determined pulse ranges during exercise with the integrated smart watch.

In Figure 5: The water tracking feature allows controlling daily water consumption by calculating the amount of water that should be consumed daily with the "kilo*0.33 formula" according to the personal characteristics of the users. The mobile application aims to reach the ideal daily water consumption by sending water drinking reminders to users at regular intervals. Users enter the amount of water they consume in ml on the water tracking page. They can also track the amount of water consumption retrospectively. Daily water consumption tracking has been added to increase the functionality of the mobile application and make it more useful.

Figure 5. Water tracking

In Figure 6: The pedometer feature is designed for users to track the total distance traveled during exercise by recording their daily step counts. This feature allows users to access past records as well as track their daily activities. Monitoring historical records and reporting the increase in performance aims to motivate users and encourage them to maintain healthy lifestyle habits.

Figure 6. Pedometer

In Figure 7: The Mobile Application uses the smart watch's health services access feature to access users' instantaneous heart rate data and transfer this data to Firebase. It saves to Firestore In addition, it constantly monitors the pulse ranges in the individually planned exercise, thus contributing to getting maximum efficiency from the planned exercise program by giving audible and vibrating warnings to the users to stay at the maxwmum and minimum pulse values determined in the program. The mobile application works integrated with the smart watch, providing a comprehensive solution focused on healthcare services and thus providing users with an interactive, user-friendly experience. In this respect, the mobile application successfully handles both technical details and complex scenarios related to healthcare. The collaboration of the mobile application with the smartwatch application provides the user with an optimally personalized health and fitness experience.

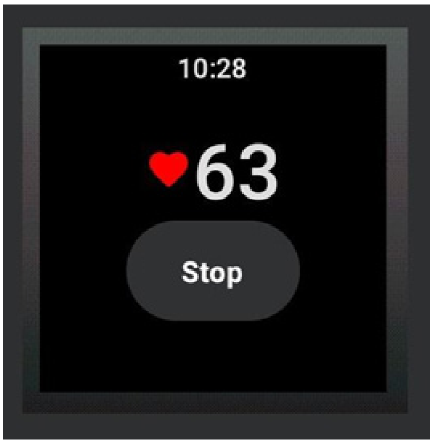

Figure 7. Instant pulse

CONCLUSION

The mobile application we have designed is designed to provide a personalized and motivating fitness experience to support users in reaching their fitness and health goals.

The mobile application encourages users to adopt healthy living habits with its aesthetic design and strong technical infrastructure. Its user-friendly interface, customized exercise programs and health tracking features make the application a valuable and effective assistant for users. This application provides guidance on achieving fitness goals and supports users in maintaining a healthy lifestyle.

This comprehensive fitness application has the potential to become a platform that can be further developed in the future. AI integration in future versions of the app may further enrich the user experience. In this way, artificial intelligence integration can make the process of using the application smarter and more interactive for users, enabling them to achieve their wellness goals faster and more effectively.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally refereed.

Conflict of Interest Statement

The authors do not have a conflict-of-interest statement.

Financial Disclosure

The authors declare that this study has received no financial support.

Author Contributions

All authors declare that they agree with the design, implementation, and analysis of the article and approve the final version

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