Fitness Tracker Mobile Application for Calisthenics Exercises

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HIGHLIGHTS

- Calisthenics is exercising in which the person's body weight is the only source of resistance.
- Mobile application developed features multimedia guides for calisthenics exercise and tracking user's progress.
- Most users agree the mobile application developed has a quick access to calisthenics exercise lesson.

ABSTRACT

Living in a world of hectic schedule between work and personal life has made many individuals difficult to find time for exercising and keep track their fitness progress. Memberships for gym nowadays is costly and even hiring a personal trainer is not everyone can afford. Due to these challenges, this paper introduces a fitness tracker mobile application named iCalFit that assists users in managing their calisthenics exercises routine and encourage individuals to engage in exercises despite their constrained time and resources. The application provides guides for calisthenics exercises, tracking users' exercises, its calorie loss and reminders. Development methodology involved three main phases which are requirement identification, design and development, and testing. The assessment of the mobile application is based on technology acceptance model, that considers three main components: Intention of Use (IU), Perceive Usefulness (PU) and Attitude (A). The questionnaire covers 15 questions distributed over to 31 randomly selected participants. PU had gained highest score out of three components, proven that the mobile application developed is efficient and capable of assisting user during exercise routine. The development of iCalFit is believed that it can solve individuals with limited fitness opportunities and drives for a healthy lifestyle.

Keywords: mHealth, Fitness Tracking Application, Calisthenics Exercises, Mobile Application.

INTRODUCTION

In the era of technology, mobile phones have grown extremely popular and common in recent years. It was because humans are becoming more familiar with machines and devices that can be used to access data, communicate with other peoples via social media and so on. Aside from that, it can assist people in storing vital data such as files and images, as well as improve communication and make new connections with people all over the world. As a result, mobile applications were built inside the phone in order to make it more engaging.

A mobile application is a computer software that runs on a mobile device such as a smartphone or tablet. Mobile applications frequently offer services that are similar to those offered on a computer. Small, isolated software entities with limited capabilities were known as applications. Annual mobile software application downloads have risen in popularity in unison with the rise in smartphone adoption, and were estimated to reach 299 billion in 2023 (*Statista*, 2023). Lifestyle, social networking, utility, games or amusement, productivity, and new or information outlets are all examples of mobile applications. Fitness tracker apps, for example, were among the most popular smartphone applications in today's world.

There are many demanding mobile applications in lifestyle such as fitness tracker applications. An activity tracker, sometimes called a fitness tracker, is a gadget or app that monitors strength and conditioning metrics such as walking or running distance, caloric intakes, and, in certain circumstances, heart rate. There are five different kind of fitness apps. For example, fitness-tracking applications, workout fitness applications, social fitness applications, competitive fitness applications and altruistic fitness applications. Health and fitness category is one of the most prominent areas among health-related applications, which span from treatment compliance to self-diagnosis. Users can save time and effort by using health and fitness applications, and they can live a healthier lifestyle (Alam et al., 2020). Any application that is related to fitness and health can be categorized by mHealth.

In the midst of busy work and personal schedules, many individuals struggle to allocate time for exercises. According to (Lenhart, 2019), study about the relationship between minimum wages and health revealing that higher minimum wages are linked to reduced exercise and health time. Attending to gym may incur more cost due to memberships and even hiring a personal trainer will definitely cost more. Consequently, these financial constraints will limit access to fitness guidance by trainer and causing barrier in maintaining a consistent exercise routine. The need for alternative solution is vital for supporting individuals' financial ability and time constraints while still able to maintain their health and fitness goals. To address this issue, this paper presents development of fitness tracking mobile application for calisthenics exercise. Despite of various existing fitness tracker application available in software store, the proposed mobile application goes thru systematic phases of software development including reports on user's acceptance. The mobile application named iCalFit features guides for calisthenics exercises with video demonstration and textual, reminders notification, keeping records of users' exercises, time and calorie loss.

LITERATURE REVIEW

mHealth Application

mHealth (mobile health) application can be defined as utilization of mobile wireless technologies for improvements in public health care (World Health Organization, 2018). With many individual nowadays are able to own smartphones, mHealth will play big roles in encouraging peoples to take better care of themselves. In year 2017, around 259,000 mHealth apps are available in app stores with approximately 3.2 billion downloads each year (Singh & Landman, 2017). mHealth may contributes to cost-effective data collection of long-term of health status, increase accessibility to health services by sharing real time health parameters to doctors or institutions related and efficient management of chronic diseases thru remote monitoring and consultations (Birkmeyer et al., 2021). Wide range of mobile application related to healthcare available in software stores are categorised into general health and wellness, tele-medicine, personal coaching and consultation, medical record tracking, custom reminders and various health management apps (Roslan et al., 2021). Various articles in literature proposed mHealth application that leads to diverse applications developed, this includes diabetes self-management apps (Kwan et al., 2023), Machine Learning and analytics-based diabetes management tools (Cedeno-Moreno & Vargas-Lombardo,

2020), interactive telemedicine platform (Samonte et al., 2019), mental health support applications (Cho et al., 2022), and nutritional and diet mobile application (Roslan et al., 2021).

Calisthenics Exercises

Physical activity defined by the World Health Organization as "any physical movement involving energy intake and generated by muscle tissue." Physical activity covers all forms of movement, whether done for pleasure, to go to and from locations, or as part of someone's job. Moderate and intense physical activity are both helpful to one's health (World Health Organization, 2020). The physical activity can be categorized to a few types of exercises. For example, aerobic exercise focuses on body's oxygen use and mostly performed for long periods at moderate level (Chenxiao Han et al., 2023). Anaerobic exercise on the other hand, is defined by the American College of Sports Medicine (ACSM) as very short duration of intense physical activity, depending on contracting muscles and does not require oxygen as a source of energy (Ferguson, 2014). Another example is agility training which tries to increase a person's ability to slow down, change directions, and manage their pace. This type of training is necessary for athletes that participate in sports that require a great deal of positioning, coordination, speed, and balance (Azmi & Kusnanik, 2018).

Calisthenics is a type of exercise that originated in ancient Greece and reappeared in the early 1800s (Rider, 2016). Individuals including athletes, military personnel, law enforcement officers, and those aiming to maintain their fitness should use these exercises in their fitness training. The exercise is referred as defined physical activity with low cost of practice closely similar to gymnastics because it does not require the use of equipment or minimal use of equipment, such as high bar or parallel bar (Thomas et al., 2017). These exercises are carried out in a variety of intensities and rhythms. It helps develop strength, endurance, flexibility, and coordination. A study also demonstrates, teenagers who practiced five minutes calisthenics exercise can reduce the risks depression, anxiety and stress levels (Hamid et al., 2023). Examples of calisthenics exercise may include push-ups, squats, planks, lunges and burpees.

METHODOLOGY

The development of iCalFit mobile application is undertaken through three phases approach that involves requirement identification, design and development and testing. These phases can be depicted in Figure 1, are categorised by activities involved. Mainly, the first phase is to gather requirements for building the mobile application that suits the needs of the calisthenics practitioners. Second phase involves activities for realizing the objectives of the mobile application and in final phase, testing includes evaluating the developed mobile application.

Figure 1: Three phases involved in iCalFit mobile application development.

Phase 1: Requirement Identification

The initial phase of the project development begins with identifying requirements of the iCalFit mobile application. Feasibility studies are carried out by finding related information about mobile applications

development, calisthenics exercises and fitness tracker applications. It is done by reviewing websites, articles, journals, and reports of related topics. Requirement analysis is required for the exploration of the features and functionality of the calisthenics-specific fitness tracker applications should have. Various existing fitness tracker applications are reviewed in terms of its usability and functionality.

Phase 2: Design & Development

In second phase, the focus is on building the fitness tracker mobile application. This phase includes two major activities which are design and development. These are crucial activities in achieving the objectives of this project. In design activity, the focus is on User Interfaces (UI) and database design. The user interfaces are designed with user-centred design principles, ensures easy navigation, interfaces for calisthenics exercise routines, and suitable data entry interfaces using Balsamiq. Database design activity considers the essential objects that includes users, records tracking and reminders. The design involved defining hierarchical data structures that include properties such as types of calisthenics exercises, levels, timer, reminder and user's information. The data hierarchy structure is defined and documented.

Development activity involves implementing the designs and turns it into mobile application with expected features and functions. Implementation of the designed UI and business requirements is done using integrated development environment, Android Studio with Java programming language. Integration of Firebase real time database with the mobile application is done with Firebase Assistant in Android Studio. Required Firebase SDK is configured to allow access to Firebase services such as real-time database, authentication, data storage and retrieval. Objects and properties for the defined data structures are also implemented in this activity.

Phase 3: Testing

Final phase of the development methodology is testing the developed mobile application that involve two activities which are to test its functionality and user's acceptance using Technology Acceptance Model (TAM). This phase begins with testing the functions developed, includes application's data entry and retrieval to and from Firebase, user's registration and sign-in to the application. In this activity, developers are looking for unexpected errors and address any issues arise. In the following activity, user acceptance of the developed mobile application is assessed using TAM. The assessment includes a questionnaire encompasses 15 questions that covers three components which are Intention of Use (IU), Perceive Usefulness (PU) and Attitude (A). Total of 31 respondents are randomly selected to test the developed iCalFit mobile application. The respondents are asked to explore and use the features and functions in the developed mobile application without any assistance or guidance. After a given period of time, they are asked to answer questionnaire prepared. Finally, data from all respondents are extracted, analysed and documented.

Mobile Application User Interfaces

The mobile application developed has several numbers of user interfaces. Figure 2.a. presents the user's authentication interface before they are able to use the application. User is required to enter correct email address and password. There are two options from this interface, tapping Forgot Password text opens the reset password activity as in Figure 2.b. while, tapping on Register text redirects user to registration form for creating new account.

(a)   **(b)**   **(c)**

Figure 2: User's login and registration interfaces.

After successful login to the application, user will be directed to home interface (refer Figure 3.a.). At home interface, six menus for user to select that includes Calisthenics Exercise, Records, Information on Calisthenics, Reminder, Profile and About App. Selecting on the Calisthenics Exercise menu will direct user to Level Selection interface which can be depicted in Figure 3.b. to confirms the level whether Low, Moderate or Vigorous. After selecting the desired level, for example moderate level, the following interface as in Figure 3.c. will be displayed for user to select the specific type of calisthenic exercise.
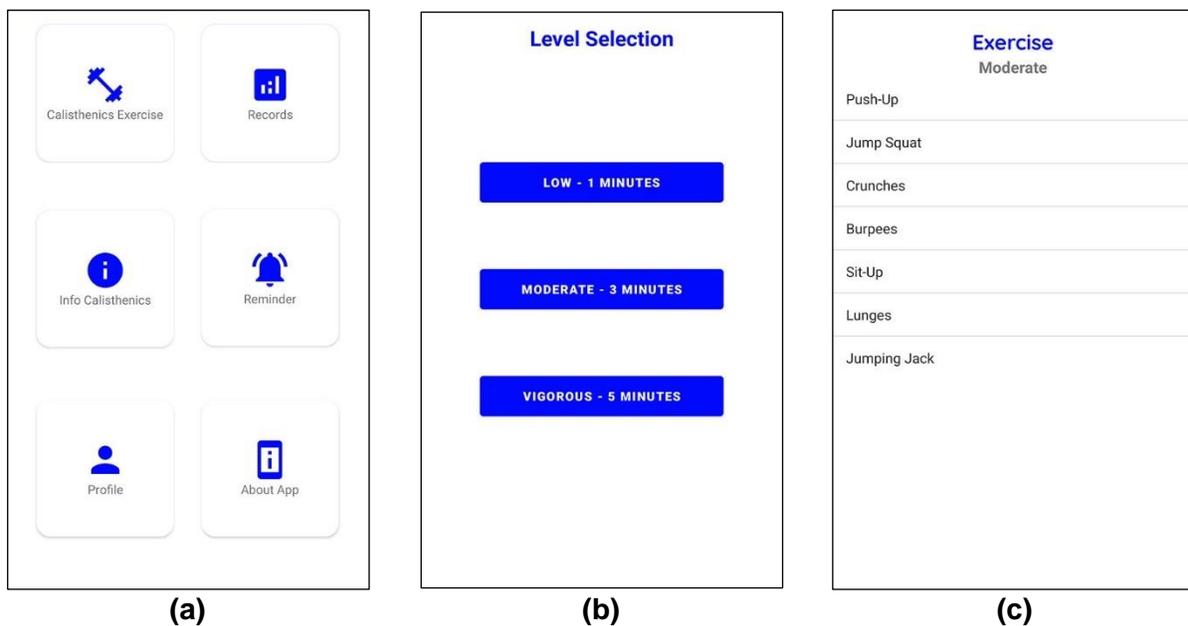

(a)   **(b)**   **(c)**

Figure 3: Home, level selections, calisthenics type selection interfaces.

Based on selected calisthenics exercise, the mobile application redirects user to new interface that has video demonstration of the selected activity, textual steps description on how to carry out the exercise and expected number of calories burned from the exercise. Samples of the interfaces can be depicted in Figure 4.a-c. In this interface, user can start tracking their activity by tapping on the start button, user also can stop or pause during the exercise by tapping Pause button. If user decided to end the exercise, they can tap on Finished button.
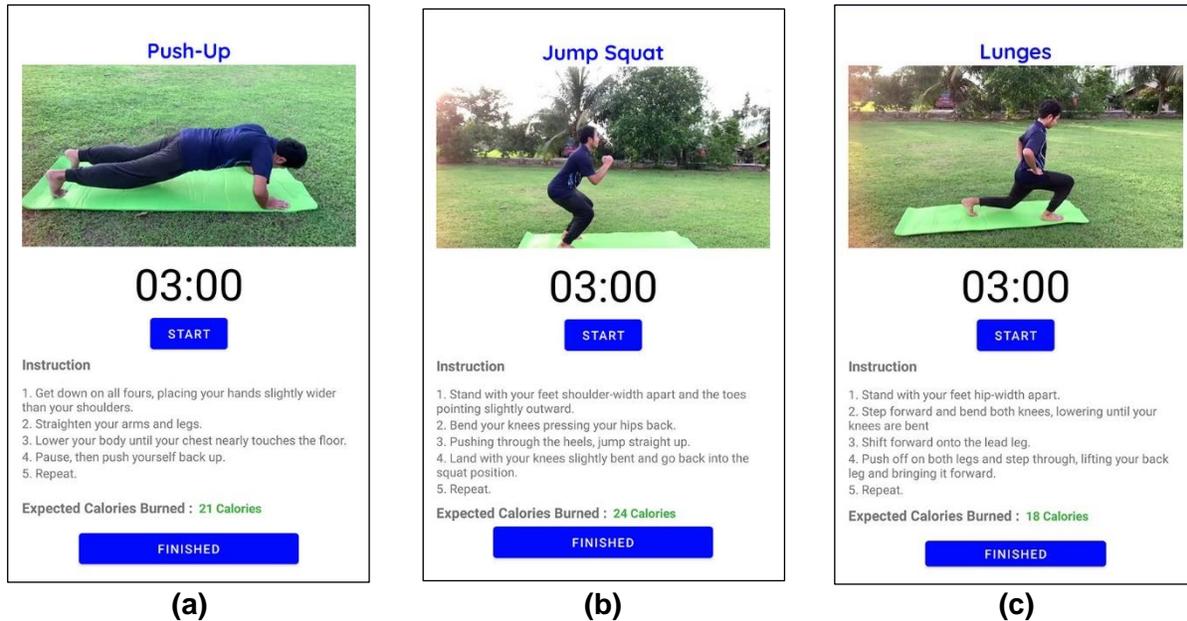

Figure 4: Samples of various calisthenics exercise interface.

After user decided to end on specific calisthenic exercise, the following interface (refer Figure 5.a.), will be displayed that consists of date, calories burned, exercise name and level. These data are stored in the Firebase. The other features available in this mobile application is reminder, which can be pre-set by user for reminding to carry out calisthenic exercise at specific time with desired message. The reminder is utilising the standard Android notification feature as a reminder to user, refer Figure 5.b-c.

FINDINGS AND DISCUSSIONS

The mobile application developed are assessed based on three components (IU, PU and A) of TAM involving 15 questions. The questionnaire is distributed to 31 randomly chosen respondents to provide their feedback after using the application. Respondent should answer with any of five ranks between one to five for each given question. Ranking table can be presented in Table 1.

Table 1: Rank and description for each question.

Rank	Description
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree
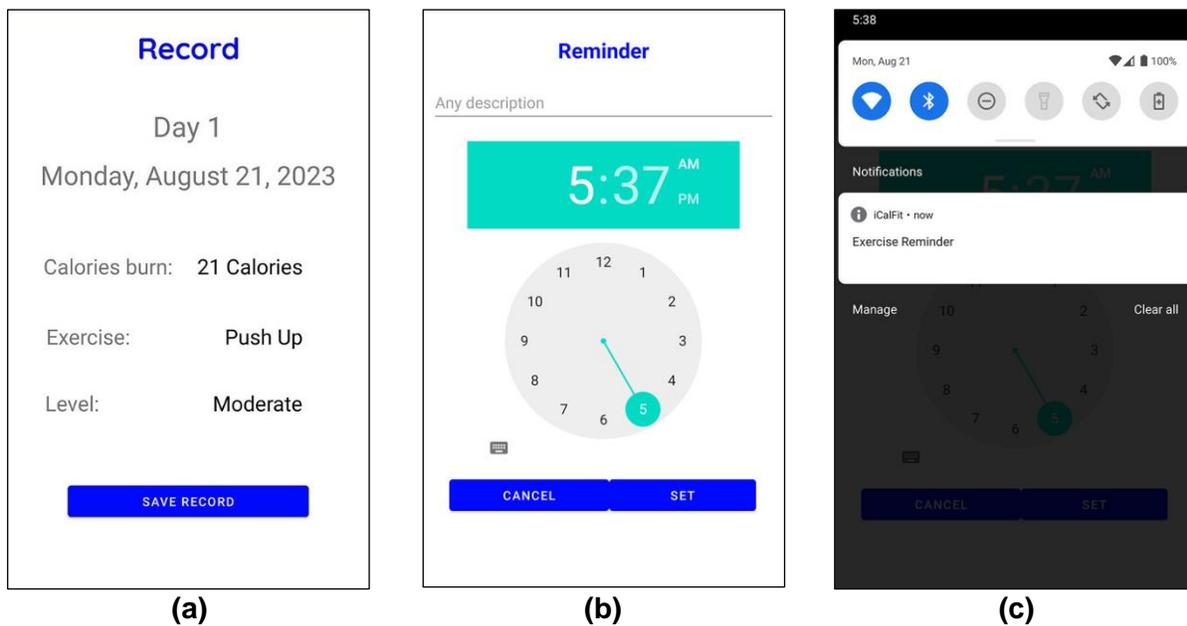
Figure 5: Completion of a calisthenic exercise and reminder interfaces.

Feedbacks from users are gathered and result of mean score are analysed. Table 2 shows the summary of results for each question and category of the questionnaire. In terms of Intention of use (IU), responses from participants indicates a positive inclination toward the intention of using the mobile application. Out of four questions under this category, questions related to preference of learning thru the mobile applications over an instructor scored highest with 4.29, however in terms of overall easy to use scored 4.13. Second component from the questionnaire includes Perceived Usefulness (PU) shows most of respondents agree on quick access to exercise lesson provided within the mobile application with score 4.42. The score is also the highest among all questions provided. Then, followed by the convenience of practising calisthenics exercise anywhere and at any time. However, the lowest score in this category is regarding the efficiency of exercise routine management, aided by reminder notifications scored 4.06. The low score value might be due to the features developed for reminder is minimal, where user have to manually set the reminder constantly and no automated or repetitive reminders included. Attitude (A) component show highest score with 4.26 for overall satisfaction of functionality and ease of use, while lowest score marked at 4.13 which shared with two questions. The first one is regarding easy interactions with application's buttons and icons to perform application's functionality and the second one about accessing any exercise information with the mobile application. Among three categories of TAM assessed in this study, PU achieved highest mean score with 4.23 mean score slightly above IU and A. It is also slightly higher than the overall mean score for all criteria with 4.2.

Table 2: Table of summary of result obtained from TAM components.

Questions / Categories	Results
Reaction of the Intention of Use (IU)	
I would prefer using iCalFit mobile application to learn about calisthenics exercise rather than using instructor.	4.29
Assuming I had access to the iCalFit mobile application, I intend to use it again in the future.	4.16

I think it would be easy for me to adapt with the interface of the iCalFit mobile application when using it.	4.19
Overall, I found the iCalFit mobile application easy to use.	4.13
Total Mean (IU)	**4.19**
Reaction of the Perceived Usefulness (PU)	
Using iCalFit mobile application would enable me to access lesson about calisthenics exercise quickly.	4.42
Using the iCalFit mobile application would enhance my effectiveness in calisthenics exercise as materials are presented in video demonstration and text instructions.	4.23
Using iCalFit mobile application platform would help users to manage their calisthenics exercise routine with reminder notification feature.	4.06
Using the iCalFit mobile application will make my exercise routine to be conducted more regularly.	4.10
Using iCalFit mobile application would enable users to do calisthenics exercise anywhere and anytime.	4.35
Total Mean (PU)	**4.23**
Reaction of the Attitude (A)	
I find the iCalFit mobile application interface (buttons and icons) an easy way to perform application functions.	4.13
My interaction with the iCalFit mobile application would be clear and understandable.	4.23
I find the video of calisthenics exercise demonstration that have been included in this mobile platform is easy to play.	4.16
I find that it is easy to find any exercise's information in this application.	4.13
This application has every function that I expected to have.	4.16
Overall, I am satisfied with the functionality and ease of use of this application.	4.26
Total Mean (A)	**4.18**
Total mean for overall of the criteria	**4.20**

CONCLUSION AND RECOMMENDATIONS

This paper has presented a fitness tracker mobile application development specifically for calisthenics exercise. The application guides user in performing the exercise thru video demonstrations and textual guides and ease user in tracking calisthenics exercise activity. The application also features a reminder for user to conduct the exercise routine. Results obtained from three core component of Technology Acceptance Model (TAM) explain a high acceptance among users. Perceived Usefulness gained highest score out of three components shows the application's ability to efficiently assist user while conducting exercise routine. The results highlight a potential of the mobile application developed to effectively facilitate users with calisthenic exercise routine.

Potential future improvements may include refining the reminder notification features for exercise routine by including more options for reminders, such as frequency of the reminder and type of exercise to remind. Other enhancement should focus on the Attitude component, especially on buttons and icons presentations, and extra information about related exercises. Other possible features may include socializing capabilities among users, analytics integration for data visualization and personalized recommendations based on progress by user.

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CONFLICT OF INTEREST DISCLOSURE

The author declare that they have no conflicts of interest to disclose.

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