# VI. PROBLEM STATEMENT

Engaging in physical activity has been proven to greatly benefit a person’s mental and physical health [5]. Similarly, researchers have established a link between mental health and physical activity, as exercise has been shown to serve as an effective outlet to relieve stress and feelings of depression [5]. In addition, participation in a consistent fitness routine has been shown to be directly correlated with college students’ academic performance and indicative of their potential success in the workplace [1]. However, many college students often neglected their physical health due to time mismanagement of their academic and personal lives [5]. College students who maintain their extracurricular activities, social lives, academic work, and sleep habits have found it difficult to set aside time for exercising [5]. As a result, research studies conducted found an estimated 40-50% of college students were physically inactive, and this would be detrimental to their overall health and well-being [3]. In response to the issue of physical inactivity in college students, Team Llama has proposed the implementation of a mobile fitness tracker app to encourage students to exercise and aid their time management.

This issue is especially significant because there are many health consequences related to being physically inactive, such as increased blood pressure and high blood pressure [2]. However, participating in exercise has been shown to combat the health effects of being physically inactive[2]. To encourage college students to exercise, we propose an app targeted towards college students that will ease the process of maintaining a consistent fitness routine through the various features the app will offer. We will utilize software engineering techniques to ensure the user has a positive experience with the app’s functionality and design.

# VII. BACKGROUND AND RESEARCH

# ABSTRACT

This paper discusses the ability of fitness applications to help college students reach their fitness goals. Team Llama has created and published a survey to determine which features are most desirable in a fitness application for college students. The data demonstrated that most college students surveyed wanted to have recommended exercises which included video demonstrations, as well as a calendar feature. A fitness application could be designed, developed, and deployed with these and other features to improve the fitness habits of college students in many environments. The scope of this project was quite small, so it would be ideal for replicated projects to achieve similar results before a final application is designed.

# *A. Introduction*

Participating in fitness activities daily has been shown to correlate with both positive mental health and a higher GPA in college students [8] [1]. However, researchers have found that almost half (40-50%) of college students are physically inactive [10]. Additionally, a lower GPA translates to fewer skills that are useful in the workforce [1]. In this paper, we have designed and followed a procedure for determining the features of an ideal fitness application for college students. The goal of this application is to help college students reach their fitness goals, ultimately allowing them to perform better in other aspects of their lives.

# *B. Methods*

The primary data collection method of this project was a short survey published on Qualtrics. This survey was distributed to different groups through various media to collect responses over a 7-day period. Data collection was performed entirely online.

*1) Participants:* For this project, 115 people were surveyed, 91 of which were college students. The participants were recruited by sharing the survey on various social media platforms such as Discord, Reddit, and GroupMe. The survey included questions about the participants’ current fitness habits, their satisfaction with those habits, and their thoughts on different aspects of using a fitness application. A complete image of the survey can be found in the appendix.

## *2) Instruments:* We first created our survey based on what information would be most useful when designing a fitness application. The initial questions ensure that the data collected is applicable for college students and that there is a need in this demographic for a new fitness application. We then brainstormed potentially useful features to include in a fitness application, both from personal experience and by studying the relevant literature to see what features are missing from current fitness applications. These suggestions were compiled in the final question to ask participants which features they would find most helpful in a fitness tracker application.

## *3) Procedure:* We used various media to distribute our survey, including Discord servers, a Canvas discussion, and a Reddit post. The survey was created on Qualtrics, and the same software was used to perform the data analysis. The automatically generated reports allow the user to filter question results based on the response to other questions in the survey, and this feature was used heavily when analyzing the data. Graphs were generated by manually transferring the data to a graph creation software.

# *C. Results*

Table 1 shows the number of participants who were satisfied with their current fitness habits, separated by whether the participants were college students.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Extremely satisfied** | **Somewhat satisfied** | **Neither satisfied nor**  **dissatisfied** | **Somewhat dissatisfied** | **Extremely dissatisfied** |
| **College Students** | 6 | 37 | 14 | 21 | 13 |
| **Not college**  **students** | 2 | 2 | 1 | 4 | 3 |

*Table 1: Number of participants satisfied with their weekly time spent exercising.*

Similarly, Table 2 displays the satisfaction of participants based on whether they were currently using a fitness application.

**Table 2:** Number of participants satisfied with their weekly time spent exercising.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Extremely satisfied** | **Somewhat satisfied** | **Neither satisfied nor**  **dissatisfied** | **Somewhat dissatisfied** | **Extremely dissatisfied** |
| **Used an application** | 5 | 10 | 1 | 8 | 3 |
| **Did not use an application** | 3 | 29 | 14 | 17 | 13 |

*Table 2: Number of participants satisfied with their weekly time spent exercising.*

Of those surveyed, 24 of the 91 college students use a fitness application. Of these students, 14 said that using an application has increased the amount of time they spend exercising weekly, and none reported that using an application has decreased their weekly time spent exercising. As shown in Figure 1, about 27% of college students exercised only 0-2 hours each week.

Hours College Students Spend Exercising Weekly

0-2 hours 2-4 hours 4-6 hours 6-8 hours 8-10 hours 10+ hours

*Figure 1: The percentage of college students who spend a certain amount of time exercising each week.*

Figure 2 displays the preferred features of fitness applications chosen by survey participants. The most preferred features are recommended exercises and video demonstrations (preferred by 63 out of 91 participants), and a calendar feature which is preferred by 52 of the 91 participants.

Number of Participants

Preferred Fitness Application Features

70

60

50

40

30

20

10

0

Chat with experts

Recommended Connect with

Calendar

exercises

others

Video Calorie counter demonstrations

*Figure 2: Preferred application features of survey participants.*

# *D. Discussion*

This project was carried out to determine if there is an area for improvement in the exercise habits of college students. The results support the need for a fitness application developed for college students, and they suggest that certain features are particularly desirable for such an application. We found that this is the case, and there are specific features that would make fitness applications desirable and useful for college students to use and improve their weekly fitness routines. However, these results are primarily applicable to participants who have lived in the region of Gainesville, Florida, so more studies should be conducted before an application is designed and produced.

It has already been found that 40-50% of college students are physically inactive [3]. Our survey found that 25 out of 91 college students get 0-2 hours of exercise each week (27%). While this is not in agreement with the research, the smaller scale of this study suggests that some variation can be expected from a wider average. This survey was conducted exclusively around the Gainesville area, so this statistic may be more indicative of college student populations in similar environments.

Using the data in Table 2, it was found that about 55.6% (15 out of 27) participants who used a fitness application are at least somewhat satisfied with their weekly exercise habits, whereas the statistic is about 42.1% (32 out of 76) for participants who do not use a fitness application. This supports the findings of a similar study, which found that using mobile applications helped college students reach their fitness goals [6].

The data from Figure 2 suggests that the most desirable features in a fitness application are recommended exercises, video demonstrations of exercises, and a calendar feature. This suggests that current applications may leave too much in the hands of the user, so these would be key features to include in a new fitness application designed for college students.

The option to connect with other users is one of the least desirable features, as seen in Figure 2. This is consistent with results found in a similar study, which determined that users would prefer not to connect their fitness applications to social media [4].

This survey was distributed exclusively via online formats, and it was distributed to participants with ties to Gainesville, Florida. As a result, many of the results may only be applicable to this specific group of subjects with internet access and a high chance of having lived in the Gainesville area. While the online aspect may not have had much of an effect on the results, those living in warmer climates such as Gainesville may have different exercise habits than those

who live in colder regions. This may have skewed the results of the study, making the process of generalizing larger college population more difficult.

Due to this limitation, more studies should be conducted in a variety of environments in order to ensure this data is applicable to a larger population of college students in the United States or worldwide. Once this has been confirmed, a new application with the suggested features can be developed to improve the fitness habits of college students.

# VIII. TECHNICAL PLAN

*A. Research*

*1) Fitness Tracking App Exercises:* Research needs to be done to decide what exercises will be included in the fitness tracking app. The exercises will differ depending on what equipment the user has available as well as any preferences the user may have. These preferences include gaining strength, power, or definition in the muscles. The exercises provided to users will vary from bodyweight exercises to exercises with equipment such as dumbbells and kettlebells. These exercises will also be planned out each week. Therefore, more data needs to be collected from fitness publications to supply users with a well-rounded and well-planned weekly fitness routine. The research will aid to appeal to the diverse exercise needs of each user.

*2) App Incentives for Participation:* It is essential to maintain, and potentially increase user participation in the fitness tracking app. App incentives will help keep users motivated and will even encourage them to strive for greater performance. Once more research is found, we will implement the most effective app incentives to increase the exercise satisfaction ratio in college students, as mentioned in the Results section (or Figure…). We will also have to take into consideration the time available for college students to exercise and plan according to each college student’s schedule.

*3) Software Implementation:* Software developers will be tasked to research ways to optimize the program’s code so the user will not have to wait on using a specific feature. This will be done by researching for programming algorithms with the shortest time complexity which is the time it takes to run a specific function of a program.

*B. Design*

*1) Receive Recommended Exercises:* Once the research is completed on the fitness tracking app exercises, we can incorporate a variety of exercises to design a weekly fitness routine catered to each user. This will also be connected to the software and algorithm implementation, as the exercises will be rotated to provide each user with an all-around workout according to their preferences. To reiterate, these preferences will depend on the equipment the user has available and the user’s goal in using the fitness tracking app, which can be to gain strength, power, or muscle definition. The design of the receive recommended exercises feature will largely depend on the two previously mentioned research aspects, where we will have to keep the user’s needs in mind. Essentially, we will need to be very detailed in order to meet each user’s exercise expectations of the fitness tracking app so, in turn, users are satisfied with their weekly workout routine.

*2) View Pre-recorded Demonstrations of Exercises:* This feature will require a trained professional in order to demonstrate how to correctly perform each exercise. It is important to carry out each exercise with proper form to prevent users from causing any injuries. Correctly performing each exercise will allow users to directly use their respective group of muscles and not cause any stress in the joints. The trained professional will be recorded performing each exercise provided to users and explaining how to accurately replicate each exercise. These recordings will then be compiled depending on the number of repetitions and exercises recommended to the user to serve as a guided video for when the user completes their workout.

*3) Record Completed Exercises with a Calendar Feature:* Including a calendar feature will allow users to easily keep a record of their past exercises. This will make it easier to stick to a schedule of different exercises, and it provides users with a sense of accomplishment each time an exercise is completed. Exercise history will be stored locally on the user’s smartphone, so this feature can be accessed even without an internet connection.

*4) Calorie Count Feature:* An additional benefit of users inputting their past exercises to the calendar feature is that it automatically calculates an estimate for how many calories were burned during that exercise. This estimate is based on the type of exercise performed, as well as its duration. If the user has a smartwatch or other device to monitor their heart rate, then this can be connected to the application to provide a more accurate estimate of the calories burned during the exercise. This feature will provide another statistic for users to measure their personal fitness, and it allows users to more easily reach their fitness goals.

*5) Chat with Experts:* One major drawback of most current fitness applications is that trained professionals have not given their feedback to the applications [7]. This application will provide a feature which allows users to chat with experts and ask any questions they may have about their fitness routine. This can be implemented similar to a private messaging feature in other applications. The simplicity of this feature will make it less likely to crash, as the chat will only have two participants in one conversation.

*6) Application User Interface (UI):* Before designing the frontend of the application, wireframes will be drawn up and presented to different teams working on the application to ensure that they are simple and intuitive. Once the wireframes have been approved, multiple teams will be designated to work on the application for different operating systems. This will ensure that the application’s frontend design is consistent with the UI of each user’s smartphone.

*C. Build*

1) *App Development and Testing:* Software developers will build the app according to the specifications detailed in the design section of the proposal. As the user interface and the app features are implemented, developers would be required use unit testing to test the functionality of individual components of the app to ensure no programming errors exist [4]. Test cases will be created in which specific outputs are expected, but if the test case output does not match the expected output, then the code will be revised. In addition, stress testing will be employed where strain will be intentionally placed on the application to identify any weaknesses it may possess [4]. This will be done by inputting invalid commands or simulating a large number of users using the app to test how the software will function under such stress. Security testing will also take place to ensure the user’s information is not able to be accessed by any malicious third parties. The testing would entail searching for any vulnerabilities in the application which could be used to access user data. Rigorously testing the app is justified because programming errors have the potential to ruin the functionality of the application and worsen the user’s experience. Testing is necessary for creating an easily accessible and functional app which elevates the user’s experience.

In the event where a major software failure is found, Standard IEEE 24748-3:2020 details the investigation process where the issue is meticulously analyzed, solutions are planned, and those planned are then approved [9]. In addition, software failures will require sections of the program to be re-implemented and re-tested to ensure program functionality [9].

# IX. BUDGET AND SCHEDULE

*A. Personnel*

Six computer scientists and computer engineers will be hired to develop the fitness tracking app. They will be paid an hourly rate of $60, which includes app development and software testing. The prototype will take around six months to build. Therefore, this leads to a budget of $57,600 per app developer, totaling to $345,600 for the five app developers. The six months allocated for building the app will account for the software design and the implementation of the view pre-recorded demonstrations of exercises feature. A professional trainer will be hired to record the exercises provided to users, which should require about two weeks of recording. The professional trainer will cost around $40 per hour for a total of 30 hours. Depending on the professional trainer hired, travel will also be taken into consideration for the budget as shown below in Table 1. A location will be selected for the camera crew and professional trainer to record the exercises, as well as an editor to edit the exercises to the proper length and format for the app. The editor will work for two weeks, for a total of 30 hours at an hourly rate of $50. There will also be a debugger team consistent of a computer scientist who will be paid an hourly rate of $60 for an additional 20 months to fix any bugs that arise and keep the app running.

*B. Equipment*

The fitness tracking app will be available to Apple and Android mobile phones. Therefore, the software equipment necessary to develop this app will include Swift and Java. The computer scientists and engineers hired are expected to have experience using these coding languages. Both coding languages are free, so the only cost for the software equipment will be the company laptops provided to each app developer. Recording equipment is also necessary to implement the pre-recorded demonstrations of exercises feature, where a professional trainer will be recorded performing the exercises available to users in the app. The professional trainer hired will be from or near Gainesville, FL, so travel costs will not be included. The exercise equipment options that will be part of the exercises recommended to users will be needed for the professional trainer to perform said exercises.

|  |  |  |
| --- | --- | --- |
| Personnel/Equipment | Quantity | Cost |
| App developer | 6 | $345,600 |
| App debugger | 1 | $192,000 |
| Professional Trainer | 1 | $1,200 |
| Camera Crew | 1 | $9,000 |
| Editor | 1 | $1,500 |
| Exercise Recording Location  (Gainesville, FL) | 1 | $4,500 |
| Exercise Recording Equipment | 1 | $5,000 |
| Company Laptop | 6 | $12,000 |
| Marketing | 1 | $150,000 |
| App Store Fee | 2 | $124 |

*Table 3: Cost breakdown for app development.*

*C. Schedule*

The research will begin on August 23rd to coincide with the start of the semester as there are the most people in Gainesville at the time. The first week will be devoted to research and finalizing both features and research. The second week will be used to find the staff needed to complete the project through interviews and contracts by September 3rd; we will have all the staff and equipment operational. The development and recordings will begin on September 6th. The personal trainer will be working with the development team to address questions regarding the application and confirm the practicality and design of features and user interface. September 17th will be the personal trainers and camera crews' last day as recoding wraps up. The editor starts on September 20th and will work for two weeks until October 1st. The developers will continue to work on the app until March 4th, 2022. The app will be completed on the same day. The debugger and the marketing team will then begin on March 7th, 2022. They both will end in 20 months, on November 6th, 2023. The continuation of the marketing team and the debugger depends on available funds after the 20-month period and the success of the app.

X. EVALUATION PLAN

Multiple surveys have found that most college-age people in the United States own personal smartphones [Olson]. As a result, a smartphone application is one of the best ways to reach as many college students as possible, allowing many to experience the benefits of this application. Additionally, applications have simplified means of contacting the developers, which allows the development team to continually receive user feedback and modify the app to meet the changing needs of college students. To take full advantage of this benefit, a designated team will be tasked with regularly reviewing user reports for suggestions on how to improve the application. This will result in greater overall satisfaction with the application and increase the user base over time.

One drawback of using a mobile application to address this problem is that multiple applications must be made for different smartphone operating systems. The marketing of this solution is also a potential drawback, as it can be difficult for applications to be spread by word of mouth. Both of these potential risks have been designated a reasonable portion of the application’s budget in order to mitigate them. The budget will fund multiple teams to develop the application for different operating systems, as well as a marketing strategy for college campuses across the United States.

At each stage of production, user tests will be performed to verify that the application is being produced on schedule. Upon deployment, the success of the application will be measured by a number of factors. Statistics such as the number of application downloads and the average rating review will be used to determine user involvement and satisfaction with the application.

The marketing team will play a key role in the final stages of application development. The primary tasks for this team will be to raise awareness among college students of the important of fitness and to present the application as a viable solution to help students balance this part of their lives. The number of application downloads will represent the number of college students who have either been reached by our marketing team or have taken initiative to work on their fitness goals with our application.

The user feedback team will also be vital to the application’s success, as they will ensure that users are satisfied with the application. Application reviews will be the primary form of feedback for this application, so any suggestions for creating new features or correcting old ones will be made through reviews. If reviews are generally positive, it will be indicative that the application is serving its intended purpose without any major problems. Otherwise, it will be the job of the user feedback team to communicate the problem to the developers so that it can be corrected quickly.

A progress report will be presented annually to the University of Florida for the first five years of working on the project. At this point, Team Llama can meet to discuss future updates on the application’s success. As outlined in this section, this application will require multiple dedicated teams for wireframing, application design in different operating systems, marketing, and user feedback. As a result, the funding will play a crucial role in the ability of these teams to perform to the best of their ability and produce a high-quality application that can benefit college students across the United States and around the world.

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