Designing A Social-based Exercise Application To Increase Physical Activity Among College Students

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ABSTRACT
Only 28% of individuals aged 18-25 achieve the recommended level of physical activity. According to the journal “Barriers to high school and university students’ physical activity,” the main barriers to physical activity among individuals aged 18-25 are lack of time, lack of motivation, and financial limitations to access fitness facilities. These changes may be associated with unhealthy lifestyle behaviors such as weight gain, poor eating habits, and sedentary lifestyles. The proposed solution to improve physical fitness according to CDC standards is the design of a digital application following the concept of social fitness, where environmental factors, friends, and enjoyable experiences will help users become more physically fit through social encouragement. By developing the mobile application “Teman Gerak” integrating features such as joining communities, finding friends, and participating in sports events, it is hoped to increase awareness and exercise experience to motivate users. The method of designing this application includes card sorting, the System Usability Scale, questionnaires, user interviews, and case studies of existing applications to analyze problems and assess the feasibility of the application.

Keywords: Motivation, CDC activity standard, Digital app, Social media, Fitness

INTRODUCTION
Only 28% of individuals aged 18-25 achieve the recommended level of physical activity (WHO, 2016). Self-reported overweight/obesity is 22%, increasing with age, particularly in males. Statistically, a positive attitude towards physical activity strongly predicts activity engagement (National Institute of Health, 2024). However, strong intentions to exercise are not associated with actual behavior. Based on data gathered from focus groups discussion revealed attitudes and barriers towards physical activity influence. Engaging in physical activity to feel good and enjoy it is more important for young people than assuming to ‘please others’ and merely wanting to look healthy. Additionally, this age group views traditional health promotion messages as empty and is not afraid of their future health. Factors contributing to low physical activity behavior in Indonesia include increased use of

electronic devices and screen time, lack of safe and accessible places for physical activity, and cultural and social norms prioritizing academic achievement over physical activity (National Institute of Health, 2024).

The goals and purpose of this topic is to Analyze the causes of insufficient physical activity among teenagers, Increasing awareness and enthusiasm for physical activity, designing an application to encourage teenagers to be physically active, and to meet the recommended physical activity standards for teenagers (at least 150 minutes per week of moderate-intensity activities, such as brisk walking, and at least 2 days per week of muscle-strengthening activities) to create healthier individuals.

LITERATURE REVIEW

Main Barrier to Physical Activity

According to the journal Ferreira Silva (2022) "Barriers to high school and university students' physical activity", the main barriers to physical activity in individuals aged 18-25 are lack of time, lack of motivation, financial constraints, and lack of access to logistical places. During this age, individuals undergo many personal, social, and environmental changes, such as moving away from home, starting higher education, living with peers or partners, and beginning employment. These changes can be associated with unhealthy lifestyle behaviors such as weight gain, poor eating habits, and sedentary lifestyles. Silva's 2022 review of 38,319 adolescents and young adults from 31 countries, psychological, emotional, and cognitive factors were predominantly examined in quantitative studies (92.0% with high school students and 94.0% with university students). In contrast, qualitative studies most frequently explored environmental factors (83.3% with high school students) and sociocultural factors (75.0% with university students).

The study believes some reasons why individuals in this age group rarely engage in physical activity are due to personal factors such as a busy lifestyle. Nearly all participants cited a busy lifestyle as the main barrier; in this context, lack of time, lack of motivation, lack of commitment, and influence from other recreational activities contribute to a busy lifestyle. As a result, young men often prioritize other activities/commitments over physical activity: "I would say lack of time for me, I have many other things to do, and I tend to prioritize physical activity as the lowest on the list."

The second is logistical factors, nearly all participants mentioned cost and access as the main barriers to physical activity. Especially access to various sports activities and the costs associated with gym memberships and equipment. The third is cognitive-emotional factors, many young men often feel that engaging in sports or going to the gym is associated with feelings of low self-esteem, inadequacy, lack of confidence, and feeling uncomfortable or embarrassed. Many participants also talked about having unrealistic goals. Being unable to achieve those goals or finding that they are not good at physical activity, these reasons are considered barriers to future physical activity. The fourth is social factors, many young men identify peer influence, social group membership (i.e., university students), and

family events as barriers to physical activity. As one participant said: “if your friends don’t exercise and go to the gym, chances are you won’t go”.

Individual Physical Activity Behavior in General

Around 2 million deaths each year are attributed to physical inactivity, with WHO stating that a sedentary lifestyle can be one of the top 10 leading causes of death and disability worldwide. Regular physical activity helps prevent and treat non-communicable diseases such as heart disease, stroke, and diabetes, as well as enhancing mental health, quality of life, and well-being.

Recommendations Weekly Activities for Teenagers and Adults

Image 1 Recommendations weekly activities for teenagers and adults. (CDC.gov, 2022)

CDC Gov Guide recommend that teenagers and adults do aerobic and muscle-strengthening for significant health benefits. Adults should engage in at least 150 minutes (2 hours 30 minutes) to 300 minutes (5 hours) per week of moderate-intensity aerobic physical activity, or 75 minutes (1 hour 15 minutes) to 150 minutes (2 hours 30 minutes) per week of vigorous-intensity aerobic physical activity, or an equivalent combination of both types of aerobic activity. Ideally, aerobic activity should be spread throughout the week. Additionally, adults should perform muscle-strengthening activities on at least 2 days per week. When adults engage in at least 150 minutes of moderate-intensity aerobic physical activity per week, the benefits are highly significant. These benefits include reduced risk of death from various causes, coronary heart disease, stroke, hypertension, type 2 diabetes, certain cancers, anxiety, depression, Alzheimer’s disease, and other dementias. Physically active adults also experience better sleep, improved cognitive abilities, and enhanced quality of life.

The Influence of Social Support on the Physical Exercise Behavior of College Students: The Mediating Role of Self-Efficacy

According to Y. Zhang’s 2022 review, which analyzes survey data from college students in six colleges and universities in Hohhot, Inner Mongolia, and applies

the theory of social support and self-efficacy, a structural equation model was constructed to examine the relationship between external support, self-efficacy, and college students' physical exercise behavior. The primary factor influencing college student's physical exercise behavior is school support. Schools play a significant role in students' daily lives, providing the most accessible exercise facilities. The promotion of values and the formation of ideological consciousness within the school environment significantly impact sports behavior. Good exercise conditions and increased opportunities for physical activity in schools can boost student participation. An optimal sports facility environment enhances enjoyment and developing a campus sports culture is crucial for sports education. Schools should lead in promoting physical exercise by investing in sports facilities, organizing sports-related activities, and encouraging active student involvement. The school's physical environment influences students' active participation through self-efficacy. Higher self-efficacy results in greater enthusiasm for physical exercise.

Peer support is the second most significant factor influencing college students' physical exercise behavior. Peer relationships play a crucial role in motivating students to engage in physical activities. When students feel supported by friends, they are more confident in participating and overcoming obstacles to exercise. Research shows that every unit of peer support increases the likelihood of participating in physical activities. Friends' encouragement and support are essential in promoting exercise behavior. Peer support, self-efficacy, and physical exercise behavior are interrelated. While some studies suggest peer support directly affects physical activities, others indicate it works through self-efficacy.

Family support has a weaker influence on college students' physical exercise behavior. Although family is the primary environment for developing habits, college students become more independent, and the impact of family support diminishes. Family support indirectly affects exercise behavior through self-efficacy. A supportive family environment, including the availability of sports equipment and parents' physical activity behavior, boosts students' confidence and encourages them to participate in and persist with physical exercise. Parents should set an example and create a positive atmosphere for physical activity.

METHODOLOGY

Research methods include data sources, collection techniques, processing, and data analysis. Method reflects how to analyze research/ study data. From the analysis of this data, results and discussion of study/ research are obtained. The research methods are divided into five main categories. First literature study is conducted for theoretical consideration, concept such as physical activity standards, physical activity guidelines, and behavior and factors of physical inactivity in a group of adolescents. Second, the primary research involved the utilization of two methods. Firstly, interviews were conducted to gather in-depth qualitative insights from participants. There are two separate interviews, the first one is with university students to learn more about their problems in doing physical activity and potential solutions to help them do physical activity. Secondly, interview with personal trainer

to learn more about his perspective about lack of physical activity for young adults and discuss how to help them be more active.

Primary research was done to obtain more qualitative data. Interviews with university students and personal trainer, questionnaires were also conducted to determine their struggle and problems on why most university students are not achieving the physical activity standard, as well as the potential design solution to help them achieve the physical standard recommended. Third, the data is analyzed to create design strategy, criteria, and product concepts, which are then used in the prototyping stage. Fourth, a usability test was done through the prototype to the user, feedback and input is given by the user as a review which gives insight on where improvement can be made. Finally, a conclusion was reached by identifying the problem, criteria, design solution, and user review.

Online questionnaires were done to collect quantitative data from a general audience. The questionnaire was distributed to 30 university students. The goal of distributing the questionnaire is to learn about their condition and habit of their physical activity, and their problems in doing / lacking physical activity. And then to relate it to a social / community-based activity as a potential solution that can help them physically more active. Activity standard is measured by the CDC which for adults at least 150 minutes of moderate-intensity aerobic physical activity per week.

RESULT & DISCUSSION

Primary Research Results

After conducting interviews with six students, we learned that the problem student have are; Campus activities (assignments, organizational activities), The long distance between the exercise location and home, Poor sleep quality (due to lack of sleep), Lack of motivation to exercise because there are no friends to exercise with. They also said exercising alone can become monotonous, so we learned that the key is to have a friend that can help maintain enthusiasm and make exercising more enjoyable.

The second interview is with a personal trainer, the reason personal trainer is interviewed is to gain insight from their perspective according to him, one way to increase university student's desire to exercise is by having an attractive physique that can become a focal point of attention. This is because today's teenagers enjoy receiving validation for things that make them more appealing in the eyes of others. The online questionnaire results show that out of 30 participant 43% of students exercise less than once a week and 16% exercise once a week. They stated that barriers to not exercising include not having time for physical activities due to other commitments and not having friends to exercise with. More than half of the students indicated that having exercises that can be done anywhere, activities that require little time, and having friends to exercise with can serve as motivation to be more active in exercising. Students also mentioned that activities such as running (36%), HIIT (23%), and cycling (13%) are the preferred

exercises to do with friends. This data will be used as a reference to determine the design solution.

Data Analysis and Design Criteria

Based on the results of observations, interviews, and questionnaires, the preparation stages for starting exercise have become the main problem that needs to be addressed immediately. Student's busy schedules with campus activities prevent them from finding time to exercise because the sports facilities are too far away or require fees.

Not having friends to exercise with causes students to be unmotivated to work out and students feel bored with their exercise experience which makes them become unserious about exercising, lose focus, and get easily distracted. This leads to students being inconsistent in exercising or not exercising at all, as the lack of motivation to exercise causes them to either not exercise seriously or not exercise at all, significantly hindering their health progress.

Physical activity standard is also implemented, the goal is to measure university students wellness and to ensure they are less likely to get negative impacts on health and well-being from not staying active. (CDC, 2024) The recommendation of at least 150 minutes a week of moderate-intensity activity and at least 2 days a week of activities that strengthen muscles. is based on extensive research into the health benefits of physical activity. This guideline is provided by several health organizations, Here are the key reasons behind this specific recommendation:

Health Benefits: Research has shown that 150 minutes of moderate-intensity activity per week is associated with significant health benefits, including reduced risk of chronic diseases such as heart disease, stroke, type 2 diabetes, and some cancers. It also helps manage weight, improve mental health, and enhance quality of life.

Manageable Time Frame: 150 minutes per week translates to about 30 minutes per day for five days a week. This is considered a manageable amount of time for most people, making it more likely that they will stick to the exercise regimen. It's a balance between achieving substantial health benefits and being feasible for people to incorporate into their daily lives.

Cumulative Effect: The 150 minutes can be accumulated over the week in various ways. For instance, it can be done in shorter sessions of at least 10 minutes each throughout the day. This flexibility makes it easier for individuals to fit physical activity into their schedules, increasing the likelihood of adherence.

Evidence-Based: The 150-minute guideline is based on a substantial body of scientific evidence. Studies have consistently shown that engaging in this amount of moderate-intensity activity leads to improvements in cardiovascular health, metabolic health, and overall mortality rates.

Baseline for Additional Benefits: While 150 minutes per week provides significant health benefits, doing more than this amount can lead to even greater health improvements. The guideline sets a baseline that is beneficial, but individuals who are able and willing to exceed this amount can gain additional benefits.

There are five design criteria were determined after analyzing data from secondary and primary research. The criteria is based on UX dimension where a products should evokes emotion, usability, usefulness, learnability, and aesthetic. The goal is to create a product that helps student's to be more motivated to exercise, by using the peer social support aspect to create sense of being supported by friends, they are more confident in participating and overcoming obstacles to exercise. The product should allows them to interact with other people to create motivation to exercise with their friends, also giving them sense of community to keep them consistent and exercise for the long term goals.

Quality Function Deployment (QFD) is a method used to transform user demands into design quality. Here, we'll create a QFD matrix to compare the best fitness applications in the market. The comparison will be done on a scale of 1-3, where 1 is the lowest score and 3 is the highest.

Table 1 QFD Exercise Apps (personal data, 2024)

No.	Criteria		App name		
		UX dimension	Fitbit	Nike Training club	Strava
1	Positive Reinforcement: Implement features that provide positive reinforcement, such as achievement badges or recognition for active participation.	**Emotion**	2	3	1
2	Provide a score, graph, or visual element that helps the user understand how close or far they are to their goals.	**Usability**	3	1	2

3	Activity tracking, exercise plan and social integration Features	**Usefulness**	3	1	2
4	Intuitive Navigation: Design a user-friendly interface with intuitive navigation	**Learnability**	3	1	2
5	Engaging Visuals: Use engaging visuals to create an attractive and dynamic platform.	**Aesthetic**	3	1	2
Total			**14**	**7**	**9**

After analyzing these three applications, it was concluded that two of them (Nike Training Club and Strava) help users become more motivated to exercise. Nike Training Club offers workouts and fitness programs such as yoga, HIIT, and bodyweight exercises, complete with video tutorials for the exercises. Meanwhile, Strava is a specialized application for cycling, running, and swimming that functions like social media due to its openness to other users globally, allowing users to see posts from others who are also exercising using the app. The Fitbit application, on the other hand, focuses more on maintaining overall individual fitness, including sleep patterns, food and water intake, and activity levels.

Out of the three fitness apps, each main feature of the apps is analyzed, it is concluded that the important feature in creating a successful fitness app is by combining the social aspect and the exercise aspect to create a sustainable healthy long term habit. These are the main feature that will be used in designing the app:

The inclusion of features like the CDC standard metric helps students track their physical activity to see if they meet fitness standards without manually calculating and tracking progress, saving them time. The flexible workout program feature also benefits students by not tying them to a specific schedule. Given the unpredictable nature of student schedules, flexible workout programs allow them to exercise on any day they choose, eliminating the need for them to research and create their own exercise plans, thus saving considerable time.

The issue of not having friends to exercise with is addressed through a feature that helps users find communities, friends, and events based on sports interests and location. This enables users to find communities and make new friends, with whom they can participate in events organized by these communities, thereby increasing their motivation to exercise.

Lastly, the problem of boredom while exercising alone can be alleviated by features such as streaks, achievements (like medals and trophies), and the ability to share workout results/photos with friends. These features make the exercise experience more enjoyable by providing a sense of accomplishment and recognition from others.

Final product

The recommended design solution is an application that can be accessed anytime and anywhere. It features options to find friends and join community based on location and shared interests, participate in real life sports event hosted by the community to make exercise experience fun and enjoyable, the app also provides moderate to vigorous intensity exercise programs for students. This effort aims to make students more active and meet physical activity standards.

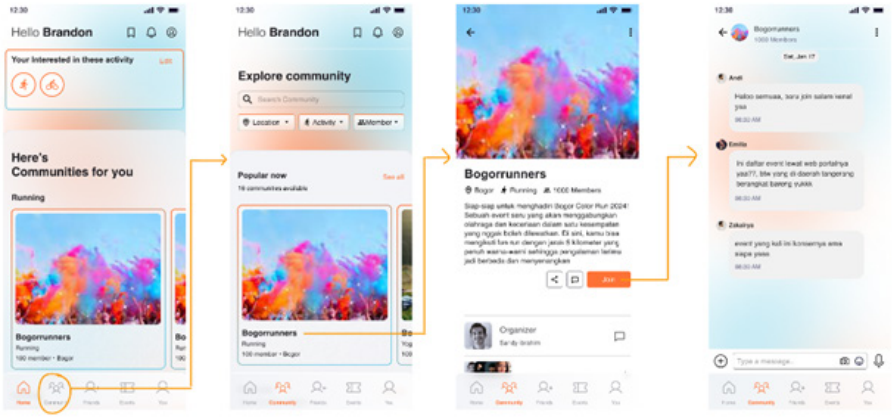

Image 2 User flow community feature. (Personal data, 2024)

Image 2 is Find community page. On this page, users can search for more communities using filters for location, activity, and members to help find the best community for them. Additionally, community content such as “Popular Now” and “Near Me” helps users discover relevant communities.

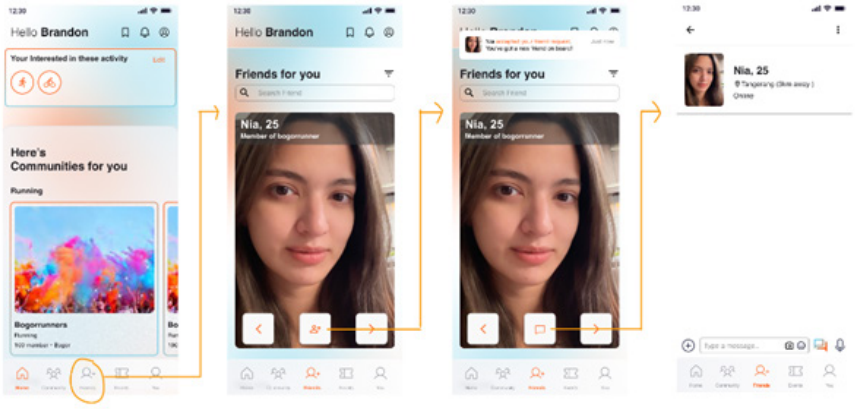

Image 3 User flow find friend feature. (Personal data, 2024)

Image 3 is the explore friends flow, where users who have joined a community will receive friend recommendations from within the same community to help them make new friends. Filters based on gender, age, location, skill level, and hobbies will assist users in finding desired friends.

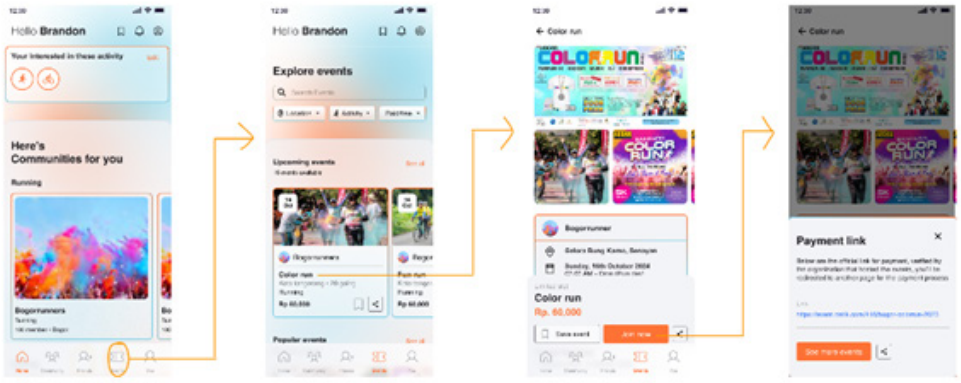

Image 4 User flow Find events feature. (Personal data, 2024)

Figure 4 is find sports event page page. Users can choose sports events offered by these communities, with filters for location, type of activity, and free/paid events. Users will be provided with complete information about the event, along with a link for registration and payment, which will redirect them to the event's portal.

Discussion

Based on the research done to university students through survey questionnaire and interviews the responds corresponds to silva (2022) study believes some reasons why individuals in this age group rarely engage in physical activity are due to personal factors such as a busy lifestyle. Nearly all participants cited a busy lifestyle as the main barrier; in this context, lack of time, lack of motivation, lack of commitment, and influence from other recreational activities contribute to a busy lifestyle. This study is proven through the questionnaire and interview with university students where out of 30 students 50% of students say that the barriers

to exercising are being busy with academic activities, leaving no time for exercise, and the lack of friends to work out with. According to 60% of students, having friends, exercises that can be done anywhere, and workouts that provide maximum results in the least amount of time are factors that can help them become more active in exercising.

Based on the interviews in depth question is asked to find out why most university students lack exercise, they said they tend to feel bored when exercising alone makes it necessary to have friends to accompany them to stay motivated to workout and staying consistent.

The final design are measured using the ux dimension criteria which explained below:

Positive Emotion Reinforcement and Clear Information: Positive reinforcement features like achievement badges must be clearly presented. Clarity of information ensures that users can easily understand what they have achieved and how, thereby enhancing their sense of accomplishment and motivation.

Score, Graph, Visual Elements, Consistency for usability: Providing visual elements that help users understand their progress must be consistent and well-composed. Placing graphs and scores in the same location and using consistent visual styles helps users quickly recognize and comprehend the information.

Activity Tracking, Workout Plans, Social Integration, Innovation for usefulness: These features are implemented innovatively to add real value for users. Social integration that allows sharing achievements through social media in unique and engaging ways can boost user engagement.

Intuitive Navigation and Ease of Use: Intuitive navigation and user-friendly design are crucial to ensure users can easily find and use features. An interface design that prioritizes ease of use will reduce friction and make users feel comfortable interacting with the app.

Visual Aesthetics: Attractive and aesthetic visuals should support the overall user experience. Using appealing colors, animations, and design elements can create a dynamic and engaging platform while maintaining clarity of information and design consistency.

By combining elements from these criteria groups, we can create a screen design that is not only visually appealing but also functional, easy to use, and provides an optimal user experience. A design that considers all these aspects will help create an effective and satisfying application for users.

The product is tested and evaluated based on system usability scale to determine it’s effectiveness. The evaluation is given on a scale of 1 to 5 as follows:

Table 2 System usability scale. (personal data, 2024)

Pertanyaan	User 1	User 2	User 3	User 4	User 5	User 6	Avg per question
Saya akan dengan sering menggunakan aplikasi ini saat ingin pengalaman berolahraga yang menyenangkan	4	4	4	4	5	4	4.1
Saya merasa tampilan aplikasi ini masih terlalu rumit.	1	2	2	1	2	2	1.6
Saya merasa aplikasi ini mudah digunakan.	4	4	4	4	3	4	3.8
Saya merasa membutuhkan bantuan dari pihak aplikasi untuk dapat menggunakan aplikasi ini.	2	3	2	2	3	2	2.3
Saya menemukan bahwa berbagai fungsi dalam aplikasi ini terintegrasi dengan baik.	4	4	4	4	4	4	4
Saya merasa masih ada terlalu banyak inkonsistensi dalam aplikasi ini.	1	1	2	1	2	1	1.3
Saya merasa kebanyakan orang dapat mempelajari aplikasi ini dengan sangat cepat.	2	4	4	4	4	4	3.6
Saya merasa aplikasi ini sulit untuk dipelajari dalam penggunaannya.	2	2	2	1	2	1	1.6
Saya merasa sangat percaya diri dalam menggunakan aplikasi ini.	4	5	5	4	3	4	4.1
Saya merasa perlu mempelajari banyak hal sebelum saya dapat mulai menggunakan aplikasi ini.	3	2	4	1	3	3	2.6
Odd numbers questions – 5 (X)	13	16	16	15	14	15	
25 – *even numbered questions* (Y)	16	15	17	19	13	16	
System usability score (X+Y) x 2.5	72.5	77.5	82.5	85	67.5	77.5	
SUS average	77						

On a scale of 1 to 5, the evaluation of ten criteria shows a total score of 77 out of 100. The average SUS (System Usability Scale) score for this application reaches an acceptable level. On average, the scores for each statement are good, but the Acceptability Score can still be improved. This can be achieved by addressing the lower ratings for statements 4 and 10, and by increasing the ratings for statement 7.

User review was also conducted, to students in university which they given feedback and the overall idea of the product. They state the app concept is very appealing, with the community and friend features helping users to remind each other and exercise together, state one of the user. Overall, the information is easy to read and understand, and the features are user-friendly, user flow are also easy to comprehend. They also state feedback about the app on where they think it needs to be improve “The Add Activity button needs to be enlarged to make it easier for users to see when they want to add an activity” said the users.

CONCLUSION

Based on the research conducted through surveys and interviews with university students, the primary barriers to physical activity are:

Busy Lifestyle: Academic commitments leave students with little time for exercise.
Lack of Motivation and Commitment: Personal factors and the influence of other recreational activities reduce motivation.

Exercising Alone: Many students feel bored and unmotivated when they exercise alone.

Lack of Workout Companions: Students often do not have friends to accompany them during exercise sessions.

Proposed Solutions is to address these problems, a fitness app was designed with the following key features:

CDC Standard Metric Integration: This feature helps students track their physical activity against fitness standards without the need for manual calculations, saving time and providing clear goals.

Flexible Workout Programs: By allowing students to exercise on any day they choose, this feature accommodates their unpredictable schedules, eliminating the need for them to create their own exercise plans and thus saving time.

Community and Friend Finder: This feature helps users find communities, friends, and events based on sports interests and location. It addresses the lack of workout companions by enabling users to join communities and participate in events, increasing motivation and providing social support.

Gamification Elements: Features such as streaks, achievements, and the ability to share workout results/photos with friends make the exercise experience more enjoyable and socially rewarding. These elements help alleviate boredom and maintain motivation by providing a sense of accomplishment and recognition from peers.

The app design effectively addresses the UX dimensions to create the best experience for the user Positive Emotion Reinforcement and Clear Information to ensure users understand their accomplishments, enhancing their sense of achievement and motivation.

Score, Graph, Visual Elements, Consistency for Usability
Visual Elements: Consistently placed and well-composed graphs and scores help users quickly recognize and comprehend their progress.

Activity Tracking, Workout Plans, Social Integration, Innovation for Usefulness. Innovative Implementation: Features add real value, with social integration allowing users to share achievements in unique and engaging ways, boosting user engagement. Intuitive Navigation and Ease of Use, User-Friendly Design Prioritizes ease of use, ensuring users can easily find and utilize features, reducing friction and making the app comfortable to interact with. Visual Aesthetics, Use of appealing colors, animations, and design elements create a dynamic and engaging platform while maintaining clarity and consistency in design.

By integrating these features and considering all UX dimensions, the app provides a comprehensive, engaging, and user-friendly platform. This ensures that users not only find the app functional and motivating but also enjoy a visually appealing and satisfying experience. The app effectively addresses the primary barriers to physical activity among university students, promoting a sustainable healthy long-term habit.This study focuses to address Physical inactivity among teenagers especially university students. An inactive lifestyle increases overall mortality and doubles the risk of cardiovascular diseases, diabetes, and obesity. It also raises the risk of colon cancer, hypertension, osteoporosis, lipid disorders, depression, and anxiety. Because Physical activity is crucial the study aims to help teenagers develop awareness and motivation to be active physically. After analyzing the data obtained from primary and secondary research, the design criteria for the product were determined. To help teenagers among university students develop motivation and awareness to physically active, the product introduce them to emotion, and social aspect, by allow them to interact with community, friends that suits their interest, so exercising can be less boring and more consistent, also implementing standard activity guideline as the activity goal.

Although there are strengths in the idea and design of the application, there are also some limitations and areas for further research. In the design of this application, there are unresolved issues such as events that have been organized may be suddenly canceled for various reasons. This can occur due to unforeseen

circumstances, such as the 2020 pandemic when everyone was advised to stay at home. As a result, all ongoing events or activities had to be canceled. Another issue is the risk of users misusing the application to meet other users, potentially causing harm to one of the parties. Preventive measures are needed to ensure that no users are harmed by the feature that allows meeting strangers through this application.

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