User-Centered Design and Evaluation of a Mobile Mental Health App for Stress Management and Relaxation

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***Abstract*—To meet the increasing demand for easy-to-use mental health applications, this study introduces the design and evaluation of an entirely new mobile application to support mental well-being and relaxation. The application was designed using User-Centered Design (UCD) principles and included numerous application features to facilitate mental health for a general audience, along with feedback from undergraduate participants. The important features were sorted out by conducting literature research and an initial assessment of current, existing solutions. The focus was therefore placed on user usability, supported by iterative user assessments, along with other key functionalities, enhancing developments in mental health app technology, and demonstrating the potential of our methodology in its design. The results revealed a strong user interest in AI-driven support within the app, moderate ratings for usability and monitoring features, and mixed reviews on other features, guiding future optimization and engagement strategies.**

***Index Terms*—Mental Health, Stress Management, mHealth, User-Centered Design (UCD), Prototype, Usability.**

I. Introduction

Apps for mental health are a big help these days. These are like having a friend on your phone. These applications provide necessary mental health resources for people who are all alone with their problems. But because of its ongoing controversy, the administration of mental health treatments has to be effectively transformed by the combined mobilization of research, lawmaking, and design [1]. There is a huge potential for mobile health applications to manage mental health illnesses, but there are also some obstacles to overcome, such as concerns about data control and integrating them with professional practice. The improvement of such obstacles must be addressed if these applications are to become more effective [2]. Apps should give priority to user-friendly communication by trying to avoid technical or complex language and should also offer flexibility in data entry and provide vast options for exploring and understanding detailed information without overwhelming users [3].

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According to current research, children and teenagers are more likely to suffer from various mental health problems. It has been found that approximately 50% of mental illnesses in adults start before the age of 15, and 75% before the age of 18 [4]. Children with such issues suffer throughout their adulthood, with 50% of mental illnesses starting before the age of 15 and 75% before the age of 18 [5]. Additionally, they heighten the likelihood of encountering additional mental health issues during adulthood [6]. There are numerous applications available on different platforms that claim to be beneficial for a specific condition or stick to a specific treatment approach. However, they might not stick to the essential principles of these therapies and may struggle to establish their efficacy [7]. Although there is a significant number of mental health applications available but they fail to satisfy the wide range of demands of users. The primary goal of our project was to understand the usability issues and develop a user-friendly prototype that puts accessibility, usability, and efficiency as first priorities. Therefore, the main objective was to reduce these gaps between consumer desires and current solutions by incorporating User-Centered Design (UCD) techniques throughout the research.

The objective of this study was to create a mobile application prototype that is easy to use and flexible enough to accommodate a wide range of user expectations. This application aims to help in the management of mental health and relaxation, and the research furthermore aims to analyze the prototype's usability, efficiency, and user satisfaction through iterative user evaluations and continuous feedback interactions

via questionnaires. This method of study also boosts the area of Human-Computer Interaction (HCI) in mental health technology significantly since the prototype is attentively developed to meet the changing needs of users. Therefore, task analysis, evaluation, usability, prototyping, understanding user needs, and needfindings were extensively studied throughout the project.

The unique characteristics of this prototype are AI personal assistants, personalized dashboards, and customized notifications, which add interest to the user experience and encourage consistent adherence to mental health practices. It also offers valuable insights into efficient design and assessment techniques that greatly contribute to the existing significant amount of academic literature on UCD concepts applied to mental health technology. In terms of utilization, the prototype is a genuine tool that mental health practitioners, organizations, and people looking for a dependable and approachable resource for mental health issues may utilize. Furthermore, due to the use of iterative design approaches and the incorporation of user feedback into the design process of the application prototype, researchers and end users were able to collaborate in productive contexts. The result ensures that the product fits the legitimate wants and needs of the target market.

II. Related Works

User assessments of depression and self-management applications indicate that app-based mental health monitoring improves self-management when it supports the specific needs of the user. However, because users' needs and preferences vary from one to another, therefore, app designers must be flexible, which presents difficulties. It is advised to enhance features in accordance with how they affect users, taking into account the app's integration with a broader health ecosystem, but the main problem is that we don't quite know what information users want to track and how they want to see it, making it tough to build the best depression-fighting apps [3]. Mental health applications accessible to teens are increasing rapidly, but the evidence supporting their effectiveness is not clearly visible. To examine both the safety and efficacy of various applications, optimal analysis, such as well-designed trials with randomized control, is urgently required. To guarantee that applications are user-centered and useful, it is also recommended to include experts and teens in the app development process [8].

The state of human-computer interaction research for visually impaired people was comprehensively analyzed using scientific measurement, which demonstrated a growing trend in publications and identified the US, UK, and India as the major contributors [9]. Earlier researchers had also investigated the potential of involving stakeholders and individuals with real-life experience in the design of mental health care to enhance therapy, increase user engagement, influence participants, and adjust design ideas with medical knowledge. However, existing research hasn't fully explored how the involvement of mental health service stakeholders in design processes can improve mental health care [10]. There is also a lack of culturally grounded digital mental health interventions for racially and ethnically underprivileged groups. This demonstrates an important gap in mental health technology. To address this, our study uses a multicultural approach to design, ensuring that our prototype matches the diverse needs and backgrounds of all users [11]. Previous research has also identified numerous important gaps in the field of mental health technology, including untested recommendation systems for people with disabilities, inaccuracies in assessment methodology, and limitations in user-friendly interfaces and privacy measures. Studies show that short-term mental health benefits can be gained from mindfulness applications, but their working procedures are unknown to us [12].

III. Needfinding Study

A. Initial Design Study

The initial phase of the needfinding study was to find the potential users and find their demand for the app. Additionally, we obtained data on user actions and experiences from app reviews of available solutions in the current app market, and we initially attempted to evaluate these by designing questionnaires that would extract the unique and beneficial characteristics of the chosen apps. This helped us to gain insights about the weaknesses and strengths of the existing solutions similar to our development objectives. We then conducted a user survey on these existing solutions, asking the users about specific features and recommendations. This step helped us in our needfinding process, and we started developing an interactive low-fidelity prototype by sketching. During the development phase of our low-fidelity prototype, we provided the participants with paper and pens and encouraged them to modify our paper prototype as well as suggest new concepts for their ideal mental health app.

B. Participants

The participants of the research survey were mostly undergraduate students from various backgrounds. We recruited them through emails and social networks, with a total of 19 participants (the age range of all of our participants was 16-30 years; 57.9% males and 42.1% females). The other participants were the members of our research group, who acted as a focus group.

C. Measures and Data Analysis

The research that we conducted was to study stakeholders and how they use and perceive mental health apps. The participants shared their thoughts on the app's design, ease of use, features, and frequency of use. They also mentioned useful features like break reminders and day-pacing tools from existing apps. We analyzed the survey data using both qualitative and quantitative methods, looking for patterns and trends. The participants provided valuable feedback on designing the app, suggesting design tweaks, better documentation, and more support options. They were excited about features like relaxation tools and community support. They also wanted more control over notifications, emails, and texts. Sleep tracking

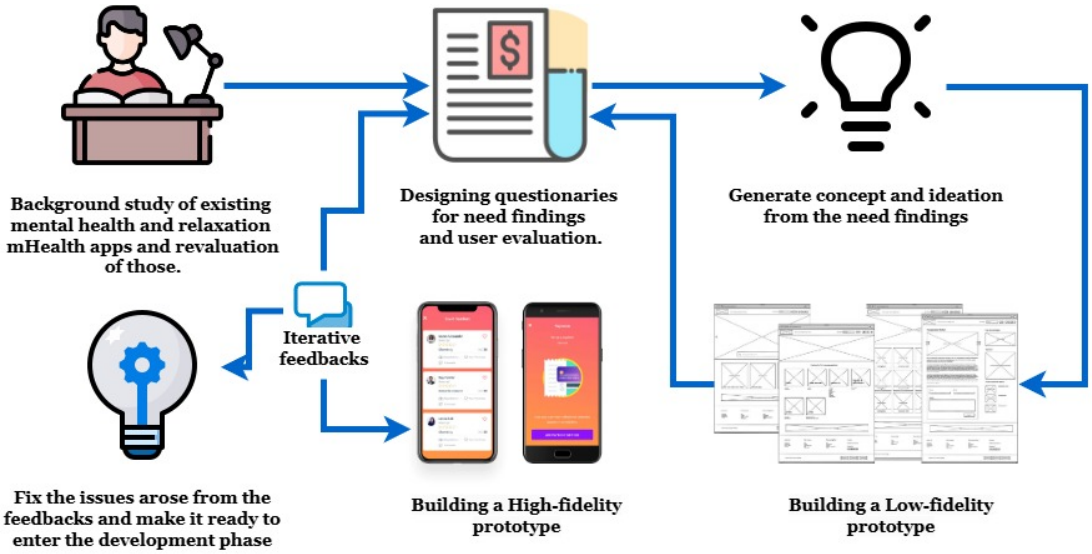


Fig. 1: Methodology overview illustrating iterative, user-centered design and usability testing for mHealth app development

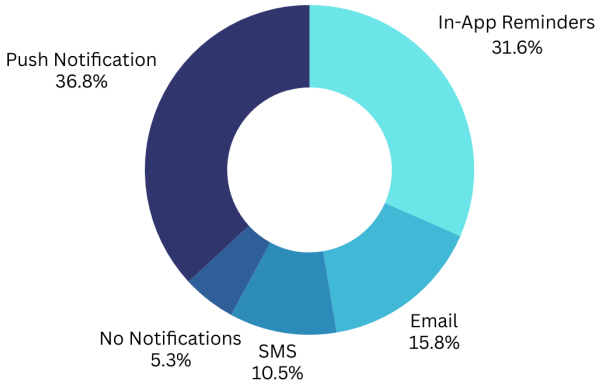


Fig. 2: User preferences for receiving notifications or reminders from a mental health app based on our initial survey

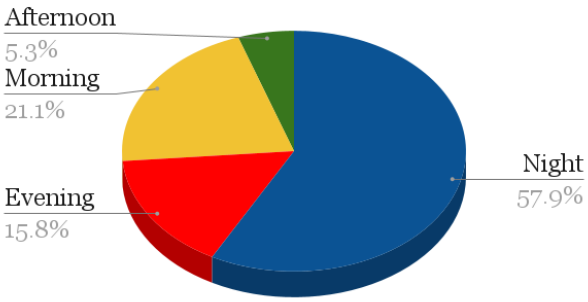


Fig. 3: Preferred times for using mental health apps, according to users in our initial survey

features, both manual and automated, were highlighted as important, along with mood tracking and the AI bot, which they believe might boost user engagement.

D. Findings

Based on our research, it has been understood that users value features and designs that are easy to use. The participants also appreciated the visual environment, which decreased their stress levels and underscored the significance of providing diverse choices. Depending on the levels of user satisfaction across the application, a number of changes must be made. In overall terms, when creating apps for people with special needs, it is essential to take into account their preferences and demands. The participants also expressed a preference for the app's color scheme to be both bright and calming [13]. Future research in this area should focus on integrating mobile apps into various forms of rehabilitation. It should keep users engaged, incorporate suggestions from medical and design professionals, investigate ways to handle responsibility and accountability, and consider how app stores may operate as barriers to promoting health and wellness apps [14]. It is also a matter of concern that the user engagement in current mHealth mental health apps is lower than expected, which is pointed out in Fig. 4 of our findings. The findings also indicate that users highly value user-friendly functionalities and visually calming environments that contribute to stress reduction. However, ease of navigation in existing wellness apps remains moderate, with

TABLE I: Comparative Analysis of Ease of Navigation in Wellness Apps from our initial survey

App Name	Average Score (1-5)
Mind Spa	3.16
Dreamfora	3.21
Calm	3.16
Headspace	3.37
Smiling Mind	3.58

average scores around 3, as shown in Table I. These were the average scores based on the responses of participants who tested the apps in our initial survey.

IV. Prototype design and Its Features

The conceptual design process began by merging the designer's model with the mental models of the stakeholders, then analyzing their interaction through iterative user studies. A throwaway prototype followed, using the sketching method, which was advantageous for saving time, but limited in some respects due to a static view and limited perspective into response time, but it identified the primary needs. The approach improved through investigation of existing solutions, user surveys, focus groups, and evaluating feedback, which facilitated idea testing without committing to specific design details. Eventually, a horizontal high-fidelity prototype was created in Figma, a widely used application platform for designing and testing mobile apps. Although this prototype had extremely limited capabilities, it encompassed a broad variety of elements, facilitating user assessment. The prototype was developed based on the study and prepared for conducting an iterative user study, with adjustments made to address emerging issues and to ready it for the development phase. The primary sources of the feature ideas are presented in Table II.

A. Welcome Page

The Welcome Page helps to introduce the new users to the app's mental health features with a calming interface and easy navigation for a smooth first-time experience.

B. Log-in Page

The log-in page aims to include security elements to safeguard the user's data. A distinct account within an mHealth app might guarantee personalized experiences by maintaining privacy and compliance, safe data access, multi-device synchronization, and AI-driven insights.

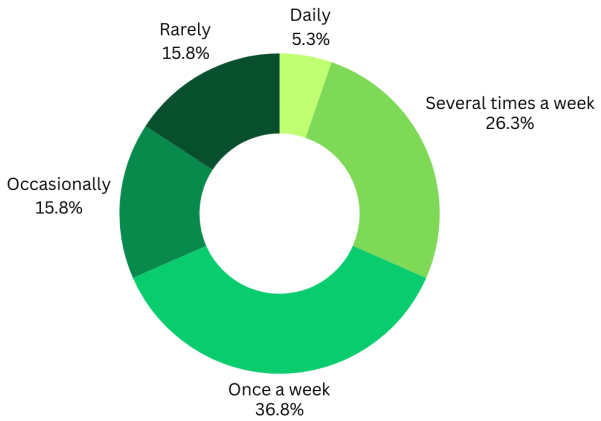


Fig. 4: Preferred frequency of use for current mental health apps based on our initial survey

TABLE II: Feature ideas gathered from the literature review, ideation, surveys, and existing solutions

Features	Literature Review	Ideation	Survey	Existing Solutions
Log-in and Sign-up		✓		✓
Sleep Analysis	✓	✓	✓	
Feedback and Support (AI bot)		✓	✓	
Crisis Support		✓	✓	
Daily Goals	✓	✓	✓	✓
Mood Tracking				✓
Mindfulness Program	✓		✓	✓
Customized Reminders			✓	✓

C. Sleep Insights

The Sleep Insights UI offers a user-friendly layout for individuals to record and evaluate their sleep habits. Within a sleep calendar, a weekly-based view enables the user to select specific days to view their sleep info and features for showing Bed Time and Alarm settings. Each of these displays the length configured and has toggle switches for turning each on or off. Higher up in the UI, a Sleep Analytics section digs deeper into understanding sleep habits. Finally, a help section titled "Have a Problem Sleeping?" provides support and resources for improving sleep management.

D. Sleep Patterns

The Sleep Patterns feature reports on sleep cycles through logging and visualization, allowing users to identify trends and irregularities. Sleep data is collected automatically through wearable bands, and also manually through user logs, so a user can log their sleep length and sleep quality. By identifying patterns and/or disruptions that are repeated within the user's sleep log, users can begin to identify factors that can affect user sleep. When the user sees their data graphed and identified information on trends, they can make informed decisions to change their sleeping habits to improve their sleeping routine and affect their overall health.

E. Mood Tracker

The Mood Tracker feature is designed to assist users in gaining further awareness about their emotions by allowing them to log how they feel each day, which can then assist them in identifying their mood trends and the triggers or events that can impact their mood. Users should notice these trends and (ideally) implement small modifications to their daily routines to manage their overall emotional health. The Mood Tracker feature also encourages self-reflection, which can make it easier to regulate stress and improve habits for mental well-being at the same time. All in all, the Mood Tracker feature gives a simple yet powerful tool for users to check in with their mental health and have agency over their emotional health.

Fig. 5: Transformation from low-fidelity prototype to high-fidelity prototype using Figma (User Dashboard and Smart Scheduler)

F. Crisis Support

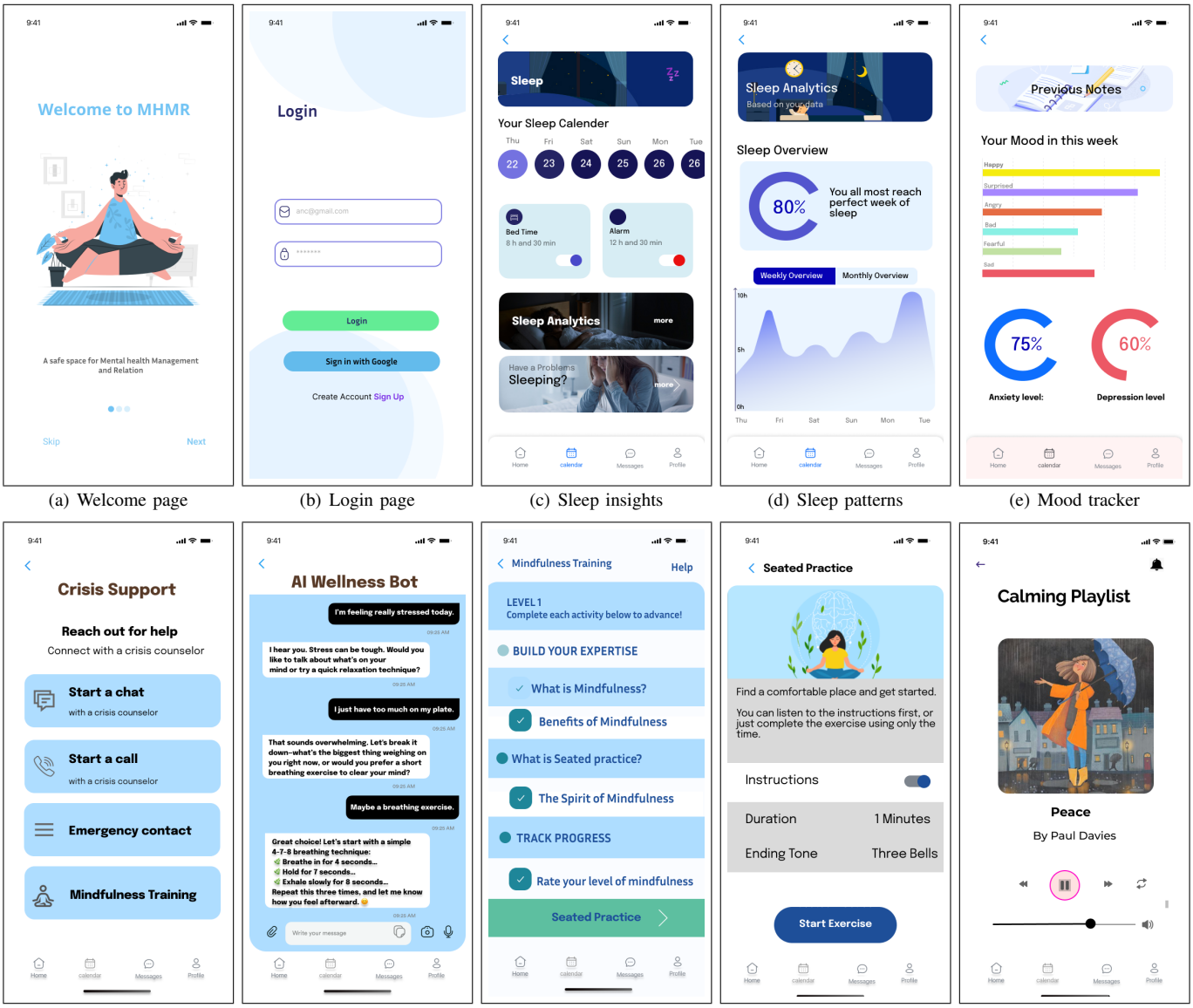
The Crisis Support feature is designed to provide instant access to professional counselors via chat, phone, or video call, as well as resources such as relaxation techniques and recommendations to local services, to ensure immediate support during acute emotional distress. It should also be able to connect users with mental health professionals in emergency cases. This will minimize their isolated feeling and increase access to the aid they require during difficult times in their mental health journey.

G. AI Chat-bot

The AI Chatbot was designed as ”AI Wellness Bot” to serve as a personalized mental health companion for particular users to provide personalized assistance and self-care suggestions based on individual requirements. Furthermore, the AI Wellness Bot can also potentially increase user engagement and help users by providing real-time replies and guaranteeing that they will always have access to personalized pieces of advice.

H. Mindfulness Training Module

The Mindfulness Training Module is a structured method of practicing mindfulness through guided sessions. These sessions contain techniques that include deep breathing, pro-



(a) Welcome page (b) Login page (c) Sleep insights (d) Sleep patterns (e) Mood tracker

(f) Crisis support (g) Ai chatbot (h) Mindfulness training module (i) Mindful practices (j) Serene sounds

Fig. 6: Prototype interface snippets in smartphone view

gressive muscle relaxation, and guided visualization exercises that enable users to manage feelings of stress and anxiety. The program provides flexibility that allows users to engage in structured programming or individual mindfulness exercises based on their individual mindfulness needs.

I. Mindful Practices

The Mindful Practices portion of the app includes everything users need to produce mindfulness practices, including the provision of step-by-step instructions for mindfulness exercises to ensure users remain present in their practice at all times. This feature provides real-time guidance within every session above when to stretch their posture, technique for breathing through the nose and not through the mouth, and how to monitor cognition and thoughts to ensure an inseparable barrier is formed between the mindfulness practice and distractions. Audio and visual cues were also tabulated to help maintain and keep engagement in the experience.

J. Serene Sounds

The ”Serene Sounds” portion of the app specifically controls the capability to arrange, provide and access soothing sounds, complete with a clearly defined purpose to decrease stress, enhance mental concentration, and soothe user members to sleep. Users can choose from a variety of pleasant natural sounds, white noise, music, or other guided sleep narratives. Regardless of the listener or user’s purpose, ”Serene Sounds” arranges soothing sounds in a manner that is both aesthetically and visually pleasing to help achieve the goals of the user’s ’unwind’ or sleep. ”Serene Sounds”

includes the ability to assemble customizable playlists to personalize the sound experience for the user, easing their ability to create a peaceful element in their daily mindfulness rituals or practices.

In addition, as shown in Fig. 5, the User Dashboard serves as the central interface, allowing users to access notifications and navigate to other pages to use the features they need. Besides, a lot of individuals with mental health disorders use digital applications to support their mental health and improve their quality of life since they find it challenging to complete their regular tasks like jobs and studies. To solve this issue, we had to design a ”Smart Scheduler” feature that would help the users prioritize their daily tasks while also providing a sense of purpose and success. This feature contains tools for task management, reminders, and progress tracking. As a result, users may maintain concentration and prevent procrastination, resulting in increased productivity and contentment.

V. Usability Evaluation

A. Measures and Data Analysis

In order to assess the effectiveness and user satisfaction with various features of our prototype, we conducted a survey consisting of several questions and asked them to rate their satisfaction level with various aspects on a scale of 5, with 1 being the least satisfied, 2 being slightly unsatisfied, 3 being neutral, 4 being slightly satisfied, and 5 being the most satisfied. The results of that feedback are shown in detail in Fig. 7. They were also asked to share feedback on the potential success of our design in the post-prototype survey, with the results summarized in Table III.

B. Findings

The initial post-prototype survey revealed that our AI Bot Assistance feature received positive feedback by highlighting an interest in AI-driven support among users. The sleep monitoring feature and data collection usability via wearable devices were moderately rated, suggesting opportunities for improvement in functionality and ease of use. Besides these, the crisis support feature and the mindfulness training features were also valued. Although the users had recommended enhancements to increase their effectiveness in further development, the Daily Goals Utility and Goal Tracking Effectiveness received favorable responses as well, reflecting their

TABLE III: Key questions from the post-prototype design survey

Questions	Yes (%)	No (%)
Did you find the features of our prototype to be user-friendly?	68.4%	31.6%
Did you find the navigation of our prototype intuitive?	78.9%	21.1%
Was the integration process of our prototype clear and helpful?	78.9%	21.1%
Did you find the visual design of our prototype appealing?	84.2%	15.8%

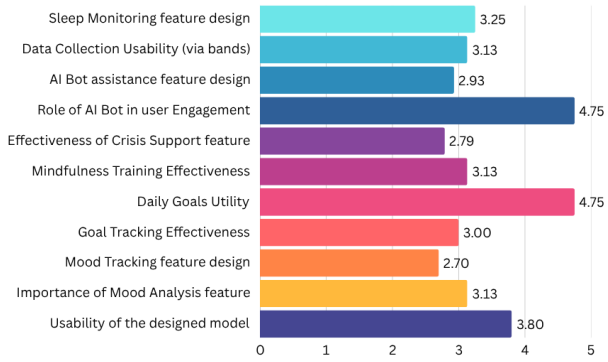


Fig. 7: Average scores from the post-design survey of the high-fidelity prototype, rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree)

usefulness, but with some room for refinement. The mood monitoring tool and the potential for mood analysis from this feature received mixed feedback from users, indicating that there are potential areas for additional development. It was also visible that the users generally preferred a moderate app usage frequency, offering in-app guidance for future engagement strategies. Such insights provide valuable direction for optimizing features to boost user satisfaction and interaction.

VI. Discussion

A. Key Findings and User-Centered Design

The key findings indicate that the prototype developed has incredible potential to meet the need for accessible, user-friendly mental health interventions. It meets key usability and functionality criteria (sleep analysis and mood tracking) and is aligned with the role of self-monitoring in mental health treatment. It also highlights the relevance of UCD principles in designing effective mHealth mobile applications. While the number of participants was limited, the research and methodology provide new paths for additional research and demonstrate the value of usability in mental health technology.

One of the important features of this mHealth app is that it can be used in a personalized way. Through research, the need of the user that was being highlighted the most is that the users wanted to get their own structured and customized routine through this app. This will provide the user with a personalized dashboard along with customized notifications, which will be beneficial for an individual user. This feature can fulfill the needs of a wide range of users. Moreover, this app has an AI personal assistant that will individually guide users according to their mental health issues and recommend proper meditation and mental health practices.

However, our mHealth app has been designed keeping the users' needs in mind because in health apps, the users' needs are one of the important aspects. Implementing an AI chatbot can enhance the experience of the users. Therefore, in our mHealth app, we have an iterative design process

where the feedback and needs from the users are analysed and incorporated into the development of our mHealth application.

B. Threats to validity

This study has several limitations that affect its validity, as the investigation relied on a very small sample, which was predominantly composed of students and may not be a suitable representative of a larger population. In addition, the testing was done with a prototype rather than a complete live app, and the online survey method may have introduced biases and lacked the depth of the interviews. These factors, including the limited sample size, the lack of an experimental setup, and the data collection approach, suggest that the results should be interpreted cautiously.

VII. Conclusion and Future Work

Future research should focus on increasing participant diversity by including various populations and multilingual users. It should also shift from prototype testing to real-world deployment, using mixed-method evaluations (e.g., surveys and interviews), and focus on developing standardized metrics to assess usability and engagement. These steps would address current limitations, such as sample bias and ecological validity. In addition, iterative design improvements, including interviews for feature optimization and content expansion based on user feedback, can improve the effectiveness of the app. These efforts will help to connect design ideas with real-world mental health users. This ensures the development of efficient, more user-friendly solutions with multiple language options while also improving the study design by including a larger and more diverse population.

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