

Integrating Design Thinking and CBT for Mobile Telemedicine Depression Recovery Therapy for Adolescents and Women

¹Steffi Adam*, ²Raymond Erz Saragih, ³Azizah Nur Arifah Awali

¹Program Studi Sistem Informasi, Fakultas Komputer, Universitas Universal

²Program Studi Teknik Informatika, Fakultas Komputer, Universitas Universal

³Program Studi Psikologi, Fakultas Ekonomi dan Psikologi, Universitas Cendekia Mitra Indonesia

^{1,2}Jl. Pasir Putih, Kelurahan Sadai, Kecamatan Bengkong, Kota Batam, Kepri, Indonesia

³Jl. Ngeksigondo No. 60, Prenggan, Kec. Kotagede, Kota Yogyakarta, Daerah Istimewa Yogyakarta 55172

*e-mail: steffiadam.ssi@gmail.com

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Abstract

Depression among adolescents and women has become a significant mental health issue, yet access to effective therapy remains limited due to factors such as geographical barriers and a lack of professional support. This research aims to integrate Design Thinking and Cognitive Behavioral Therapy (CBT) to develop a mobile telemedicine application, Moelih, for supporting the recovery of depression. The study employs a systematic Design Thinking approach, including Empathy, Define, Ideate, Prototype, and Test stages. The black-box testing method was employed to evaluate the app's functionalities, ensuring that its features—such as mood tracking, journaling (both free and guided CBT), and teleconsulting with professional companions—are intuitive and effective from the user's perspective. The results demonstrate that the Moelih app successfully meets the needs of its target audience by providing an accessible, flexible, and user-centered digital therapy tool. However, the testing phase revealed areas for improvement, such as enhancing user engagement and optimizing app responsiveness. This research highlights the potential of combining user-centered design and CBT to create effective digital interventions for mental health recovery, contributing to the growing field of telemedicine for mental health.

Keywords: adolescent and women, cognitive behavioral therapy, depression recovery, design thinking, mobile telemedicine

1 Introduction

Depression has become one of the most prevalent mental health issues, particularly among adolescents and women in Indonesia. According to various studies, the prevalence of depression in these groups has shown a significant upward trend in recent years [1], [2], [3]. The factors contributing to depression in these groups are diverse, including social pressures, academic challenges, and other psychological factors that are often inadequately addressed. The consequences of untreated depression can lead to a significant decline in quality of life, and in more extreme cases, may result in suicidal behavior [4], [5]. Given the high prevalence of depression in Indonesia, especially among adolescents and women, this issue requires more serious and integrated attention.

One approach that has been proven effective in supporting depression recovery is Cognitive Behavioral Therapy (CBT). CBT focuses on altering negative thought patterns and maladaptive behaviors that are primary contributors to depression [5], [6]. This therapy has been widely applied with positive results, but it is often hindered by issues of accessibility, especially in Indonesia, which faces a shortage of mental health professionals. The limited number of healthcare professionals means

that many individuals with depression are unable to access this therapy in person. Even though CBT is effective, a significant number of individuals undergoing therapy do not complete their treatment programs, increasing the risk of relapse with more severe symptoms [7], [8]

Telemedicine, or healthcare services based on digital technology, presents a solution to overcome these barriers. With telemedicine, obstacles such as distance, time, social stigma, and a lack of healthcare professionals can be minimized. Telemedicine allows individuals with depression to access therapy online, including CBT, without the need for in-person consultations with a professional [9]. However, the next challenge lies in designing an application that supports the success of therapy and enhances patient engagement in the recovery process. One approach that can be used to design an effective application is Design Thinking. This innovation method focuses on a deep understanding of user needs and creates solutions that are relevant, easy to use, and well-accepted by users [10], [11]

Based on these issues, this research aims to propose the integration of Design Thinking and CBT in the development of a mobile telemedicine application designed to assist in the recovery of depression in adolescents and women. By adopting a user-centered approach, this application is expected to enhance patient engagement, improve therapy completion rates, and reduce the likelihood of relapse. The significance of this study is to contribute to the development of technology-based mental health solutions that are more accessible, personalized, and effective, thereby supporting sustainable recovery for individuals suffering from depression.

2 Literature Review

In recent years, several studies have explored the development of digital mental health interventions, with a particular focus on Cognitive Behavioral Therapy (CBT) and mobile applications. Callan et al. [12] conducted a study using the user-centered design method to develop and test the CBT MobileWork application, which emphasizes "Home Assignment" as a critical component of CBT. The results indicated high satisfaction levels from both patients and therapists with the CBT MobileWork application. Similarly, Islami et al. [13] applied the design thinking approach to create a mobile-based counseling application. Their research demonstrated that applications developed using design thinking were well-received by users, emphasizing the effectiveness of this method in creating user-friendly interfaces for mental health applications. Furthermore, Rizki et al. [14] utilized design thinking to develop the "Mental Care" application, which addresses the needs of individuals with mental health issues. Their findings suggested that the design thinking approach successfully met users' needs and helped them better understand the mental health challenges they faced.

In addition, Graham et al. [15] conducted a literature review, which revealed that the user-centered design approach has been effectively used to intervene in mental health disorders, particularly those associated with eating disorders, such as anorexia nervosa [15]. Laboe et al. (2025) also conducted usability testing on a CBT-guided self-help mobile application for individuals with anorexia nervosa, a mental disorder related to eating disorders. Their study found that participants enjoyed using the application, but also highlighted areas where improvements were needed [16].

However, despite these advancements, there remain gaps in the integration of Design Thinking and CBT, especially in the development of mobile telemedicine applications aimed at supporting the recovery of depression in adolescents and women. While the studies above primarily focused on general mental health issues or specific disorders such as anorexia nervosa, there is a lack of research combining the user-centered design approach with CBT specifically targeted at addressing depression in these populations. Depression in adolescents and women presents unique challenges that are not fully addressed by existing applications, which often fail to engage users effectively or offer personalized therapy tailored to their specific psychological needs.

The proposed study aims to fill this gap by integrating Design Thinking with CBT to develop a mobile telemedicine application specifically designed for the recovery of depression in adolescents and women. This research is expected to make a significant contribution to the field of digital health by combining a deep understanding of the psychological needs of target users (through Design Thinking) with the application of proven therapeutic principles, such as Cognitive Behavioral Therapy (CBT). By focusing on the particular psychological challenges faced by adolescents and women with depression, this study seeks to develop an innovative solution that improves user engagement,

enhances therapy completion rates, and reduces the likelihood of relapse, thus providing a comprehensive approach to mental health recovery in a digital context.

The novelty of this research lies in its unique integration of these two approaches to address a critical gap in the existing literature on digital mental health interventions for depression. While previous studies have explored CBT or Design Thinking separately, this study aims to combine both methods to create a more effective and personalized mobile therapy platform, offering long-term support for individuals in need.

3 Research Method

The Design Thinking approach integrated with Cognitive Behavioral Therapy (CBT) is utilized in this work to develop a mobile-based telemedicine application aimed at supporting the recovery of depression in adolescents and women. Figure 1 shows the Design Thinking steps in this approach.



Figure 1 Design thinking

The research process is divided into several interconnected phases, each designed to explore, define, develop, and test effective solutions for the challenges faced by users experiencing depression. The first phase is empathy and identifying the problem. This phase begins with conducting interviews and focus group discussions (FGDs) with users experiencing depression, including adolescents and women, as well as professionals such as psychologists and CBT therapists. The goal of these activities is to gain a deeper understanding of the users' needs and challenges related to therapy. In addition, observations are made to analyze user behavior when interacting with existing applications or when they do not use any therapeutic applications at all. Surveys are distributed to understand user perceptions and expectations of CBT-based applications, and user personas are created to represent the demographic and psychological characteristics of the target groups.

The second phase, define and develop therapy strategy, focuses on clearly defining the problem faced by the users through the creation of a problem statement. This problem statement will serve as the foundation for designing the application's features and user experience. In this phase, the main goal of the application is also determined: to provide an effective therapy that is accessible to adolescents and women experiencing depression.

In the ideate and develop therapy techniques phase, the research focuses on brainstorming sessions to generate creative ideas for the CBT-based application. This is followed by mind mapping to explore various features and interactive elements within the application that could enhance the user experience. Additionally, alternative solutions are analyzed to identify which features would be most beneficial for the targeted user group. During this phase, usage scenarios are also developed to illustrate how users will interact with the application, both in individual and group therapy sessions.

Following the ideation phase, the research proceeds to the prototyping and therapy simulation phase. In this phase, a wireframe or mockup of the application's user interface is created, including interactive elements such as the homepage, menus, and other components. This UI design must be user-friendly and intuitive. Additionally, a low-fidelity prototype is developed to create a simpler, functional version of the application. This prototype is then tested to assess the core features that will be included in the application. A key focus of this phase is ensuring a high level of personalization in the app, allowing each user to feel that the application meets their individual needs. A mobile application prototype is then developed based on the determined design and features.

The final phase, test and evaluate therapy, involves testing the application with users experiencing depression, including adolescents and women. This testing is conducted through direct interviews and in-field use of the application to collect both qualitative and quantitative feedback. Based on the testing results, iterative design improvements are made to refine and enhance the application, ensuring it is effective and user-friendly for those undergoing therapy.

Through this user-centered approach, the research aims to create an innovative solution that not only improves patient engagement in therapy but also provides an effective tool for depression recovery, utilizing technology that is accessible in a digital format.

4 Results and Analysis

In this section, the results of each step are presented. In the first phase, regarding the empathy stage, interviews were conducted with two experts. Each of the experts has a background in the field of Clinical Psychologist for Adolescents and Adults, and Clinical Psychologist and Online Adolescent Practitioner.

Based on the interview with the expert in clinical psychology specializing in adolescents and adults, the expert underscores the critical importance of early identification and the multi-factorial nature of depressive symptoms, such as persistent sadness, anhedonia, fatigue, sleep disturbances, and appetite fluctuations—consistent with diagnostic standards established by the National Institute of Mental Health (NIMH). The expert emphasized that when these symptoms remain untreated, patients often experience feelings of entrapment, which can escalate to suicidal ideation, a trajectory supported by Mayo Clinic[17] research on the risks of untreated clinical depression.

Regarding etiology, the interview data suggest that depression is frequently the culmination of chronic, unaddressed stress rather than a singular precipitating event. In adolescent populations, this chronic stress is often rooted in academic performance pressure and interpersonal conflict, both of which foster a profound sense of helplessness. This aligns with existing literature, such as that from the Mayo Clinic[17], which identifies chronic, unresolved stress as a primary catalyst for the onset of depressive episodes. Diagnostic protocols, as outlined by the expert, rely heavily on the temporal persistence of clinical symptoms. Consistent with Cleveland Clinic guidelines [18], a formal diagnosis necessitates that the observed symptoms persist for a duration of at least two consecutive weeks and result in significant impairment to the individual's daily functional capacity. This temporal requirement is a critical diagnostic benchmark, serving to differentiate clinical depression from transient emotional distress and ensuring that intervention is targeted toward those meeting established clinical thresholds

In addressing adolescent depression, the expert highlighted a reliance on evidence-based psychological frameworks, specifically CBT and Client-Centered Therapy. CBT is utilized for its efficacy in restructuring the maladaptive thought patterns that underpin depressive states. This clinical application is corroborated by the Child Mind Institute, which identifies CBT as a highly effective modality for adolescents by facilitating the recognition and alteration of destructive cognitive cycles. Complementing this directive approach, Client-Centered Therapy allows patients to navigate toward self-identified solutions under professional guidance. The success of this dual approach often hinges on the patient's evolving ability to internalize and understand their emotional states through the therapeutic alliance. Despite the availability of these interventions, significant barriers to treatment efficacy remain. A primary obstacle identified in the interview is the patient's level of self-awareness and readiness for change. Many adolescents exhibit a reluctance to engage in the therapeutic process, particularly regarding structured homework such as clinical worksheets. These observations align with the American Psychological Association's (APA) findings, which cite a lack of motivation and commitment as a predominant challenge in adolescent therapy, often hindering overall clinical outcomes.

The expert expressed the view regarding CBT, which is a structured, evidence-based psychotherapeutic approach that centers on identifying and modifying maladaptive thought patterns in order to influence emotional regulation and behavioral outcomes. The interview findings emphasized that CBT operates on the premise that negative cognitions contribute significantly to emotional distress and dysfunctional behavior. By systematically challenging and restructuring these cognitive distortions, patients are able to develop healthier patterns of thinking, which subsequently lead to improvements in mood and behavior. This perspective is supported by Rasinget al., [19] whose research demonstrates that CBT is particularly effective among adolescent populations in facilitating the replacement of negative thought patterns with more adaptive cognitions, thereby enhancing emotional well-being and behavioral functioning. In addition to its cognitive focus, the interview highlighted the potential for CBT to yield measurable improvements within a relatively short

timeframe, in some cases within as few as four sessions. However, it was also noted that short-term gains do not necessarily ensure sustained progress. Continued therapeutic engagement and reinforcement are essential to maintaining positive outcomes. Family involvement, in particular, was identified as a critical factor in supporting the generalization of therapeutic strategies beyond the clinical setting. These observations align with the meta-analytic findings of Cuijpers et al., [20] which indicate that although CBT is broadly effective across various psychological conditions, treatment duration and consistency significantly influence long-term efficacy. Thus, while CBT may produce rapid initial improvements, sustained therapeutic support remains vital for maintaining these changes over time.

Despite its demonstrated effectiveness, several challenges may impede the successful implementation of CBT. The interview revealed that insufficient family support can undermine the therapeutic process, particularly when patients require encouragement to practice newly acquired skills outside of sessions. Furthermore, adherence to therapeutic tasks, such as completing cognitive restructuring worksheets or engaging in behavioral exercises, was identified as a common difficulty. Orsolini et al [21]. similarly emphasize that the effectiveness of CBT, especially in the treatment of depression, is closely linked to patient commitment and active participation. The extent to which individuals consistently apply CBT techniques in their daily lives significantly determines treatment outcomes. Consequently, both patient engagement and supportive environmental factors are critical components in maximizing the benefits of CBT within clinical practice.

The interview findings with the expert indicate that while traditional face-to-face therapy remains the preferred modality among many practitioners, CBT-based telemedicine is gaining increasing acceptance, particularly among adolescents. Participants noted that young people are often drawn to technology-based interventions because they offer convenience, speed, and accessibility. Telemedicine platforms provide opportunities for individuals who may otherwise face barriers to attending in-person sessions, such as geographical limitations or scheduling constraints. Consistent with these observations, the Child Mind Institute [22] highlights that digital platforms can expand access to mental health services, especially for youth populations. However, concerns persist regarding the capacity of technology-based therapy to foster deep therapeutic alliances, which are traditionally considered central to effective psychological treatment.

In discussing the core components of effective telemedicine applications, the interview emphasized the importance of structured and interactive features. Functions such as automated reminders, progress monitoring tools, and systems that provide positive reinforcement were identified as particularly valuable in maintaining patient engagement. These features help replicate certain elements of in-person CBT, such as accountability and feedback, within a digital environment. This perspective is supported by the American Psychological Association [23], which underscores the role of engagement-enhancing tools in improving adherence and outcomes in technology-based therapeutic interventions. The integration of such features can strengthen patient motivation and encourage consistent participation in therapeutic exercises.

Despite these advantages, several concerns and barriers associated with CBT-based telemedicine were identified. Data security and confidentiality emerged as prominent issues, reflecting broader ethical considerations surrounding digital health platforms. Additionally, interview participants noted challenges in personalizing interventions to meet the unique psychological needs of individual patients. The absence of nonverbal cues and in-person interaction may also limit the depth of therapeutic engagement. The American Psychological Association [23] similarly acknowledges that although telemedicine increases accessibility, obstacles such as technological discomfort, privacy concerns, and potential limitations in establishing strong therapeutic relationships remain significant. Therefore, while CBT-based telemedicine offers promising opportunities for expanding mental health services, careful attention to ethical, technical, and relational factors is essential to optimize its effectiveness.

Lastly, the expert identified several significant contributors to depression in adolescents, particularly academic pressure and challenges within the social environment. Participants emphasized that many adolescents experience intense stress related to academic performance, competitive school environments, and the expectation to gain admission to prestigious institutions. These external pressures often create persistent anxiety, feelings of inadequacy, and fear of failure, which may contribute to the development of depressive symptoms. This perspective is consistent with

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information provided by the Mayo Clinic[17], which recognizes academic stress and social pressures as major risk factors for adolescent depression. The convergence between the interview data and existing clinical literature suggests that environmental and performance-related expectations play a substantial role in the onset and progression of depressive symptoms among young individuals.

Regarding therapeutic interventions, the interview further indicated that CBT for adolescents under the age of 18 should not always be implemented as a standalone approach. Instead, it may need to be adapted and combined with complementary strategies, such as behavioral activation, particularly for adolescents presenting with more complex or severe emotional difficulties. Tailoring treatment to developmental needs was highlighted as essential to ensure engagement and effectiveness.

The second expert, a clinical psychologist and online adolescent practitioner, described a structured model of online counseling delivered through video calls, phone consultations, and real-time chat. Each counseling cycle extends over a three-day period. Clients are required to present prior clinical diagnoses at the outset, and no new diagnosis of depression is established during these sessions. When necessary, clients are referred for further clinical evaluation using standardized psychological assessment tools. This approach ensures that online services function as supportive or follow-up care rather than as a substitute for comprehensive diagnostic procedures.

The therapeutic approach implemented by the psychologist is individualized according to each client's psychological condition and readiness for change. Once clients reach a stage of acceptance regarding their emotional difficulties, CBT techniques are introduced. The primary objective of CBT in this context is to identify and modify maladaptive or erroneous thought patterns in order to influence behavioral outcomes. However, the psychologist noted that cognitive restructuring conducted in an online setting may be less effective than in traditional face-to-face sessions. Limitations in observing nonverbal cues and reinforcing corrective thinking through digital communication channels can reduce the depth and immediacy of therapeutic intervention.

For clients requiring more intensive support, the therapy model emphasizes the development of self-awareness as a foundational component. Clients must recognize their need for assistance and demonstrate motivation to engage in the therapeutic process. The use of structured worksheets and systematic progress tracking forms a central part of this intensive model. While these tools are effective in monitoring improvement and maintaining therapeutic direction, the psychologist observed that the extended duration and self-directed components of online therapy may contribute to client fatigue. Compared to in-person sessions, online interventions may require more sustained effort from clients, which can affect adherence over time.

Several challenges associated with online therapy were also identified. A significant barrier is the lack of consistent family support, which can hinder adolescents' ability to implement therapeutic recommendations, including completing worksheets and practicing cognitive exercises. Despite these challenges, the expert emphasized that CBT-based online therapy can remain effective when implemented with appropriate tools and structured guidance. Although addressing cognitive distortions and providing intensive support may be more complex in digital environments, the integration of worksheets, progress tracking systems, and consistent therapeutic communication can enhance outcomes.

Following the interviews with the two experts, the next stage is to interview the users who are experiencing depression. The interviews were conducted with five respondents with various backgrounds. The majority of respondents are female (80%), with ages ranging from 22 to over 35 years. Most respondents are employed in non-formal sectors (e.g., private employees or other jobs). Most respondents (80%) have been diagnosed with depression for over a year, with some having been diagnosed for more than three years. Depression diagnoses were generally made by psychologists or psychiatrists, reflecting the diversity in the selection of professionals for this diagnosis. This highlights the importance of a more personalized medical approach to managing depression.

Respondents have undergone a variety of therapies. Medication therapy is the primary choice for most respondents (60%), although some have also sought alternative therapies such as journaling, Islamic-based therapy, and grounding techniques. This suggests that, in addition to conventional medical therapy, respondents are seeking alternative therapies that meet their specific needs. The factors most cited as supporting recovery from depression are family support and emotional support from close relationships. Many respondents emphasized the importance of being listened to, having someone to provide emotional support, and maintaining a healthy lifestyle. This indicates that, in

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addition to medical treatment, social support and physical well-being play important roles in the recovery process.

Some respondents suggested features for an application that could track their emotions regularly, as well as provide information and videos related to mental health. Most also indicated that they would prefer consulting with a psychologist or psychiatrist online through the application, given the convenience and flexibility. Most respondents (80%) expressed their willingness to participate further in this research, indicating openness and interest in participating in a study aimed at improving the understanding and treatment of depression.

After interviewing the users, the following step is to create the user persona, which conceptually models the end user [24] In this work, the created user persona is identified as “Dina”, an adolescent with depression and online therapy. Dina is a 22-year-old female student who works as a freelance graphic designer. She has had a diagnosis of depression for over one year, and has been using online therapy and CBT.

The detailed background of her is as follows. The user persona “Dina” is a student who also works as a freelancer. Over the past year, she began to feel helpless, often anxious, and lost interest in activities she once enjoyed, such as drawing and socializing with friends. Eventually, she was diagnosed with depression by a psychologist. Despite undergoing medication treatment, she still feels the need for additional support to manage her negative feelings and cognitive distortions.

Dina presents with several core symptoms commonly associated with depressive disorders. She reports experiencing a persistent sad mood accompanied by a marked loss of interest in activities she previously enjoyed, including her hobbies. In addition to affective symptoms, she describes ongoing fatigue despite obtaining a full night’s sleep, as well as restlessness that contributes to disturbed sleep patterns. These symptoms indicate both emotional and somatic components of depression. Furthermore, Dina demonstrates cognitive distortions, particularly in the form of excessive guilt and self-blame. She feels responsible for not meeting her personal expectations in completing academic and work-related tasks and expresses guilt about her perceived inability to support her parents during their struggles. These maladaptive thought patterns appear to reinforce her negative emotional state.

Several contributing factors appear to underlie Dina’s depressive symptoms. Academic stress plays a significant role, as she experiences substantial pressure to meet educational expectations while simultaneously managing freelance work responsibilities. The cumulative demands of these obligations contribute to heightened stress and emotional exhaustion. In addition, Dina faces social challenges, particularly difficulties in interacting with peers. These social struggles intensify her feelings of isolation and may further exacerbate her depressive symptoms.

In terms of needs and therapeutic goals, Dina expresses a strong desire for emotional and social support. She values having family members and close friends who are willing to listen and provide a safe space for her to discuss her feelings and concerns. Beyond interpersonal support, she seeks improvement in her overall mental health through practical tools that promote self-monitoring and reflection. Specifically, she is interested in using an application that enables daily mood tracking and provides feedback on her emotional patterns, allowing her to better understand and manage her depressive symptoms. Additionally, Dina prefers a more flexible therapeutic approach. She reports feeling bored or disengaged during lengthy face-to-face therapy sessions and, therefore, seeks access to online therapy through a telemedicine platform that better suits her preferences and lifestyle.

Regarding technology use, Dina demonstrates a clear preference for telemedicine applications that facilitate remote psychological support. She values the convenience of consulting psychologists or psychiatrists through video calls or chat-based communication, which reduces the time and logistical demands associated with in-person sessions. Essential features she desires in such an application include automated reminders for therapy sessions and progress evaluations, mood-tracking tools to monitor daily emotions and activities, and direct communication channels with mental health professionals.

Dina’s motivation for recovery appears conditional but present. She is cooperative and willing to engage in therapy when she acknowledges her need for help and expresses readiness to begin the recovery process. However, she also indicates a need for more intensive and continuous support to maintain engagement. Several barriers may impede her progress. She struggles with independently completing therapeutic tasks, such as worksheets, particularly in the absence of consistent family or professional support. Additionally, she reports becoming disengaged when therapy sessions are

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prolonged, preferring quicker and more accessible interventions delivered through digital platforms. These factors suggest that a structured yet flexible, technology-assisted CBT approach with integrated support mechanisms may be particularly suitable for her needs.

The following phase is regarding the define stage. In the context of depression recovery for adolescents and women, many have experienced difficulty accessing reliable and continuous therapy. While CBT has proven effective in addressing depression, key barriers include time limitations and the lack of familial and social support. The need for solutions that provide real-time emotional support and allow users to change negative thought patterns via flexible, accessible mobile platforms is evident. These users also need tools for continuous progress monitoring and interaction with psychologists via teleconsulting.

The proposed CBT-based mobile application is designed to provide accessible and flexible psychological support tailored specifically to adolescents and women experiencing depressive symptoms. The primary objective of the application is to expand access to therapy by offering multiple modes of communication, including video calls, phone consultations, and real-time chat with licensed psychologists. By integrating CBT principles into its digital framework, the application aims to assist users in identifying maladaptive thought patterns and systematically restructuring them into more adaptive and constructive cognitions. In addition, the platform incorporates structured progress-tracking tools that allow users to monitor their daily emotions and activities, thereby promoting self-awareness and emotional regulation. To further enhance engagement and adherence, the application includes automated reminders, motivational prompts, and regular feedback mechanisms. These features are intended to maintain user participation and strengthen the continuity of therapeutic intervention. Ultimately, the platform seeks to facilitate meaningful and effective teleconsultation between users and mental health professionals within a secure and user-friendly digital environment.

During the ideation stage, several key concepts were generated through brainstorming sessions. One central idea involved the implementation of real-time therapy features, enabling synchronous communication through video calls, chat, and phone calls. Another major concept focused on an emotion-tracking feature that would allow users to record daily feelings and receive analytical feedback on emotional patterns. The development of interactive CBT modules was also proposed to guide users in recognizing cognitive distortions and practicing thought restructuring techniques independently. Additionally, reminder and notification systems were considered essential for sustaining engagement and ensuring consistent participation in therapeutic activities.

The mind-mapping process further refined these ideas by identifying features most responsive to the needs of individuals experiencing depression. Emphasis was placed on personalization, ensuring that therapy options could be adapted to each user's psychological condition and preferences. Easy access to therapy sessions and intuitive navigation were also highlighted as critical components to reduce barriers to use and enhance overall user experience. In the solution analysis phase, several alternative approaches were evaluated. These included live video-call sessions with psychologists as the primary intervention model, fully self-guided CBT modules for independent use, a structured mood-tracking system to monitor emotional fluctuations, and reminder-based compliance tools to improve adherence. Each alternative was assessed in terms of feasibility, user engagement, therapeutic depth, and alignment with identified user needs.

Finally, usage scenarios were developed to illustrate how individuals would interact with the application in real-world contexts. For example, a typical scenario demonstrates a user scheduling and attending an individual therapy session via video call, completing mood-tracking entries before the session, and receiving follow-up feedback and reminders afterward. These scenarios helped validate the practicality of the proposed features and ensured that the application design aligns with user expectations and therapeutic objectives.

The results from the ideation stage were then being implemented in the prototype stage. The prototype design of the mobile application, called "*Moelih*" is presented in this section. The initial screen of the *Moelih* app is shown in Figure 2.



Figure 2 Initial display

The initial screen of the *Moelih* app shown in Figure 2 is designed to offer a calming and welcoming user experience. This is achieved through the use of soothing green tones and a tree logo with heart-shaped leaves, symbolizing care and attention to mental health. The “Let’s Get Started” button guides users through the initial steps of their mental health journey within this app. The minimalist layout keeps the focus on the app’s primary goal, which is to support users in taking care of their mental health. Returning users can log in directly, allowing them to continue their therapy or recovery process. The following create account and login page is shown in Figure 3 and Figure 4, respectively.

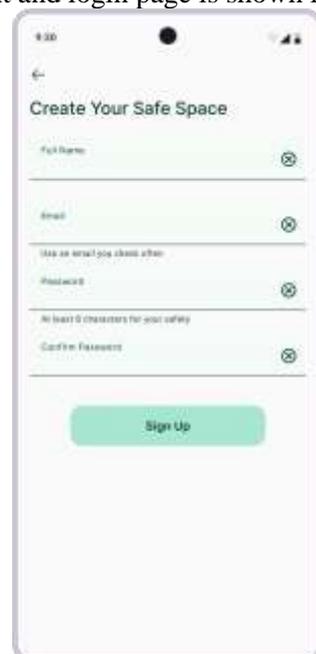


Figure 3 Create account page

In the create account page, as shown in Figure 3, users create a new account by entering basic information. The design is kept simple and intuitive, ensuring a straightforward and user-friendly registration process. Users are asked to provide their full name and a valid email address. Additional

instructions, such as “Use an email you check often,” were added to ensure smooth communication with users. The user is asked to input a secure password and confirm it for additional security.



Figure 4 Login page

Figure 4 shows that the login page welcomes users back to the *Moelih* app. The additional welcoming message, “Welcome Back,” hopes to offer a friendly and inviting tone. Users are asked to enter their previously registered email and password. The login page design is straightforward and minimalist, making it easy for users to access their accounts and resume their therapy. After a user is successfully created or signed into their account, they will be guided to the main page, as shown in Figure 5.

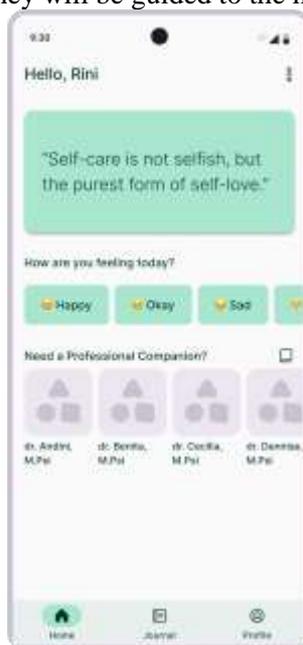


Figure 5 Main page

The main screen of *Moelih*, shown in Figure 5, greets users with a personalized message to add a personal touch to the experience. The top of the screen features a randomly generated inspirational quote to encourage users, followed by a prompt asking, “How are you feeling today?” with emoticons representing various emotions, such as Happy, Okay, Sad, Stressed, and Tired, allowing users to log their current feelings quickly. Below this section, users can select from a list of available

psychologists for teleconsulting. Almost every page of the app features a bottom navigation bar that provides easy access to the Home, Journal, and Profile sections, enhancing the user's experience and ensuring a smooth transition between different sections of the app. Users can access their journals through the journal button in the navigation bar, as shown in Figure 6.



Figure 6 My journal page

The *My Journal* page, as shown in Figure 6, serves as a space for users to document their daily thoughts and experiences shown at figure 6. The page displays journal entries by date and provides labels such as “Free” or “Guided CBT,” indicating whether the entry was self-directed or part of a guided therapy session. This is where the CBT integration is designed within the app. Each entry can be opened to view more details, offering users flexibility in tracking their previous entries. This design hopes to encourage users to reflect on their mental health journey. The interface of the free and guided CBT is shown in Figure7 left and right, respectively.

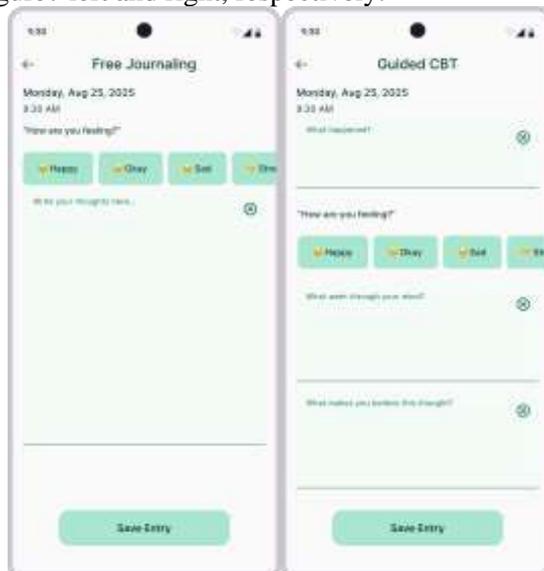


Figure 7 Free journaling (left) and guided CBT (right) pages

In the free journaling section, shown in Figure 7 (left), the users are given an open space to express their thoughts and feelings without any specific structure. The prompt “How are you feeling?” with emoticons enables users to log their emotions quickly, and they are encouraged to write freely in the “Write your thoughts here...” section. Once finished, users can save their entries for later reflection.

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Conversely, the guided CBT page offers users a guided journaling experience utilizing CBT techniques. Users are asked to identify the triggering event, their feelings, and the thoughts associated with those feelings. They are also prompted to provide evidence for and against these thoughts, encouraging users to analyse and challenge their cognitive distortions. This structured approach aligns with CBT principles, guiding users through the process of cognitive restructuring. Additionally, users can select professional companions, such as a psychologist, who will support them on their mental health journey. The professional companions page is shown in Figure 8.



Figure 8 Professional companions page

As shown in Figure 8, each professional’s overview profile is displayed, including their name and credentials, allowing users to learn more about their background and expertise.

The prototype *Moelih* app is then further processed into the testing stage. The results are presented in Table 1, combining both the black-box testing method and the core functionalities tested in the app.

Table 1 Test case table: *moelih* application flow testing

Feature	User Action	Expected Result	Actual Outcome
Start (No Account)	Click “Let’s Get Started” to navigate to the Sign-Up page	Navigate to the Sign-Up page	Successful
Sign In	Click the “Sign In” button to navigate to the Login page	Navigate to the Login page	Successful
Login	Enter valid credentials and click “Login” to navigate to the Home page	Navigate to the Home page	Successful
Home	Click the “Home” menu to navigate to the Home page	Navigate to the Home page	Successful
Journal	Click the “Journal” menu to navigate to the Journaling page	Navigate to the Journaling page	Successful
Profile	Click the “Profile” menu to navigate to the Profile page	Navigate to the Profile page	Successful
Sample Mood Check	Click the “Happy” mood button to select a mood	Mood selected and stored in the system	Successful
Professional Companion	Click “View All Professional Companions” to see the list of professional companions.	Display a list of professional companions with available information	Successful
Add Journal	Click “Add Journal” to add a journal	Prompt to select the type of	Successful

Feature	User Action	Expected Result	Actual Outcome
	entry	journal (Free or Guided CBT)	
Free Journaling	Select “Free Journaling” to add a free-form journal entry	Free journaling feature activated, and the user can write freely	Successful
Guided CBT	Select “Guided CBT” to add CBT-based journaling	Guided CBT journaling is activated, with prompts and structure	Successful
Edit Free Journaling	Click “Edit” on the free journal entry to edit content	User can edit journal content, save changes	Successful
Edit Guided CBT	Click “Edit” on the CBT journal entry to edit content	User can edit CBT journaling content, save changes	Successful

The testing phase utilized black-box testing, focusing on the overall functionality of the *Moelih* app without knowledge of the internal code or architecture. The testing was conducted through various user actions to ensure the core features worked seamlessly and as intended from the user perspective. The results from this phase demonstrate that all tested functionalities of the app performed successfully. Key functions, such as sign-up, login, mood tracking, journaling (both free and guided CBT), and professional consultations, were all executed as expected.

The black-box testing method enabled the team to assess the application’s external behavior, ensuring that interactions were intuitive and met user needs. Some features, such as the journal editing and mood selection, worked as expected, confirming that the design and interface are effective. The feedback gathered during this stage has provided valuable insights into how users engage with the app, as well as areas for further refinement, including the potential enhancement of engagement features and improving speed during interactions. In conclusion, the application’s core features, including mood tracking, journaling, and professional consultation, were successfully tested and evaluated.

Several user feedbacks were taken to provide the users’ perspective regarding the application. Overall, based on respondents’ feedback, the application offers relevant, sufficiently complete features that align with users’ needs and support their self-healing journey. In terms of user interface, the design is considered appealing, neat, and fairly attractive. The use of a calm, neutral color palette is seen as the right choice, as it could foster a sense of warmth and relaxation. Regarding its effectiveness, the respondents indicated that the application is helpful and has potential; however, further refinements are required to maximize its impact. Improvements could be made to several aspects of the features, such as adding mental health literacy content, such as educational articles and informative reading materials. Another suggestion from the respondent is regarding the inclusion of relaxation music as an enhancement to further assist in neutralizing intense emotions and calming the mind. Lastly, respondents expressed their hope that the application will continue to be developed and improved to better support users. This supports the fact that further iteration may be necessary to enhance user engagement and ensure a smooth experience, particularly in terms of the application’s responsiveness and interaction with users. This feedback will guide further improvements in the application’s development.

The *Moelih* application, which integrates design thinking and CBT, has been designed to support the recovery of depression among adolescents and women; however, its clinical testing has not been intensively tested. Although the application is designed to assist users in recording their daily journals, it is not intended to replace professional mental health services. Users are strongly encouraged to continue consulting qualified mental health professionals to support their ongoing self-healing process. During data collection, this study ensured that, wherever possible, personally identifiable information was anonymized to protect respondents’ privacy and confidentiality.

5 Conclusion

This study aimed to develop a mobile telemedicine application, *Moelih*, by integrating Design Thinking and Cognitive Behavioral Therapy (CBT) to aid in the recovery of depression among adolescents and women. The research followed a systematic process, utilizing the Design Thinking framework, which included the stages of Empathy, Define, Ideate, Prototype, and Test. The testing phase applied the black-box testing method, which focused on evaluating the app's functionality from the user's perspective without delving into its internal structure. The results of the research indicate that the *Moelih* application successfully addresses the key needs of its target users, providing accessible and flexible therapy through features like mood tracking, journaling (both free and guided CBT), and teleconsulting with professional companions. The application enables users to participate in therapy sessions remotely, providing a convenient and effective alternative to traditional in-person therapy, particularly for individuals who face challenges such as time constraints and a lack of familial support. Through the testing phase, the application demonstrated successful navigation, interaction, and functionality across all features, confirming that the core functionalities of *Moelih* met the expected outcomes. However, the testing also identified areas for improvement, particularly in enhancing user engagement and ensuring the app's responsiveness during interactions. These insights will guide future iterations to refine the app and further optimize its effectiveness for depression recovery. Overall, this research successfully integrates Design Thinking and CBT into a telemedicine application. The applications' features have been included as intended; however, their clinical effectiveness has not yet been tested. There are several limitations in this work, such as having a small sample size, a lack of clinical testing, and having no depression measurement. Further development based on user feedback and improved clinical testing will likely lead to an even more effective solution for addressing depression through digital means.

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