

The Efficacy of a Mobile Application-Based Cognitive Behavioral Therapy (CBT) in Reducing Anxiety and Depression Symptoms Among Young Adults in the Post-COVID-19 Pandemic: A Randomized Controlled Trial

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ABSTRACT

Background: The COVID-19 pandemic has significantly increased anxiety and depression prevalence among young adults globally, with Indonesia experiencing substantial mental health challenges. Mobile application-based cognitive behavioral therapy (mCBT) interventions have emerged as promising solutions to address these widespread mental health issues. **Objective:** This randomized controlled trial aimed to evaluate the efficacy of a mobile CBT application in reducing anxiety and depression symptoms among Indonesian young adults in the post-COVID-19 pandemic period through comprehensive qualitative analysis. **Methods:** A mixed-methods randomized controlled trial was conducted with 25 young adults aged 18-25 years. Participants were randomly assigned to receive either the mCBT intervention or waitlist control. Qualitative data were collected through in-depth semi-structured interviews, focus group discussions, and thematic analysis following a phenomenological approach. **Results:** Thematic analysis revealed six major themes: Digital Therapeutic Alliance (89 mentions), Behavioral Change Process (92 mentions), Empowerment Through Technology (76 mentions), Resilience Building (67 mentions), Social Connection in Digital Space (54 mentions), and Challenges and Barriers (43 mentions). Participants demonstrated significant improvements in coping mechanisms, stress management, and emotional regulation through the mCBT intervention. **Conclusions:** Mobile CBT applications show promising efficacy in addressing post-pandemic anxiety and depression among Indonesian young adults. The intervention facilitated meaningful behavioral changes, enhanced self-efficacy, and provided accessible mental health support during challenging recovery periods.

Keywords: Mobile Health, Cognitive Behavioral Therapy, Anxiety, Depression, Young Adults

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1. INTRODUCTION

The COVID-19 pandemic has fundamentally transformed the global mental health landscape, with young adults experiencing disproportionately high rates of anxiety and depression. The World Health Organization (WHO) reported a 25% increase in the global prevalence of anxiety and depression during the first year of the pandemic, with young adults aged 18-25 years being particularly vulnerable to psychological distress. In Indonesia, studies have documented that 20-25% of the population experienced anxiety symptoms, along with significant rates of depression and stress during the pandemic waves [1].

The post-COVID-19 recovery period presents unique mental health challenges for young adults, characterized by ongoing uncertainty, disrupted social connections, educational interruptions, and economic instability. Indonesian young adults face challenges related to social isolation, career uncertainty, academic stress, and financial concerns during this transitional period. The persistent nature of these stressors has necessitated innovative and accessible mental health interventions that can effectively reach this vulnerable population effectively [2].

Traditional face-to-face mental health services have faced significant limitations during and after the pandemic including restricted access, long waiting times, stigma, and resource constraints. These barriers have highlighted the critical need for scalable, evidence-based, digital mental health interventions that can provide timely support to young adults experiencing psychological distress. Mobile health (mHealth) applications have emerged as promising solutions, offering unprecedented accessibility, anonymity, and flexibility in delivering mental health care [3].

Cognitive Behavioral Therapy (CBT) is the gold standard for treating anxiety and depression, with extensive evidence supporting its efficacy in diverse populations. The integration of CBT principles into mobile applications has demonstrated significant potential for reducing psychological symptoms, while maintaining the core therapeutic mechanisms of traditional CBT. Digital CBT interventions have shown particular promise among young adults, who demonstrate high smartphone adoption rates and comfort with technology-mediated healthcare delivery.

Recent systematic reviews and meta-analyses have provided encouraging evidence for the effectiveness of mobile CBT applications in reducing anxiety and depressive symptoms. Studies have reported effect sizes ranging from small to moderate ($d = 0.19$ to 0.47) when comparing smartphone interventions with inactive controls on measures of psychological symptoms. However, the strength of the evidence varies considerably across different study designs, with more rigorous comparison conditions generally yielding smaller but more robust effects [4].

The theoretical foundation for mobile CBT applications relies on established principles, including cognitive restructuring, behavioral activation, exposure therapy, and mindfulness-based techniques. These interventions typically incorporate features, such as mood tracking, guided exercises, progress monitoring, psychoeducational content, and interactive elements designed to enhance user engagement. The self-guided nature of many mobile CBT applications allows users to access support at their own pace and convenience, potentially reducing the barriers associated with traditional therapy delivery [5].

Research examining mobile CBT applications has identified several key factors that influence its efficacy and user engagement. Studies have highlighted the importance of evidence-based content, user-friendly designs, personalization features, and ongoing support mechanisms. User feedback analyses have revealed that successful applications typically provide clear therapeutic benefits, maintain high usability standards, and offer meaningful interactive experience. Conversely, technical issues, limited personalization, and lack of creative content have been identified as common barriers to sustained engagement [6].

The post-COVID-19 context presents unique considerations for digital mental health interventions in young adults. The pandemic has accelerated the adoption of digital technologies for health purposes, while simultaneously creating specific psychological needs related to isolation, uncertainty, and trauma recovery. Indonesian young adults have demonstrated a particular vulnerability to COVID-related psychological distress, with studies indicating high rates of hypervigilance, avoidance behaviors, and pandemic-related anxiety symptoms [7].

Cultural factors also play an important role in the effectiveness of digital mental health interventions in the Indonesian context. Research has highlighted the significance of family relationships, social support systems, and cultural values in shaping mental health outcomes in young Indonesian adults. Mobile CBT applications must therefore consider cultural adaptations and local contextual factors to maximize their relevance and effectiveness for this population [8].

This qualitative research approach offers valuable insights into the lived experiences of young adults using mobile CBT applications, providing a deeper understanding of the mechanisms underlying therapeutic change. Thematic analysis methodologies have proven particularly effective in exploring user experiences, identifying key therapeutic processes, and understanding the barriers and facilitators of successful intervention outcomes. This approach enables researchers to capture the complexity and nuances of digital therapeutic relationships and behavioral change processes [9].

Despite the growing interest in mobile CBT applications, significant gaps remain in our understanding of their effectiveness, specifically among young Indonesian adults in the post-pandemic context. Most existing research has been conducted in Western populations, with limited attention paid to cultural adaptations and contextual factors relevant to Southeast Asian contexts. Furthermore, few studies have employed comprehensive qualitative methodologies to explore the deeper mechanisms and user experiences associated with mobile-CBT interventions [10].

The current study addresses these gaps by conducting a randomized controlled trial specifically focusing on Indonesian young adults in the post-COVID-19 period and employing qualitative research methods to provide a comprehensive understanding of intervention efficacy and user experiences. This research contributes to the growing body of evidence supporting digital mental health interventions while addressing the specific needs and contexts of Indonesian young adults recovering from pandemic-related psychological distress [11].

2. METHOD

This study employed a mixed-methods randomized controlled trial design, with a primary focus on qualitative analysis, to evaluate the efficacy of a mobile application-based cognitive behavioral therapy intervention. This research utilized a phenomenological approach to explore the lived experiences of young adults using the mCBT application, supplemented by quantitative measures to provide a comprehensive understanding of intervention outcomes. The study design incorporated elements of participatory action research to ensure cultural relevance and engagement throughout the research process.

A randomized controlled trial framework was selected to provide a rigorous evaluation of intervention efficacy while controlling for potential confounding variables. Participants were randomly allocated to either the intervention group (mCBT application) or the waitlist control group using computer-generated randomization sequences. The waitlist control design was chosen to address ethical considerations while maintaining scientific rigor, allowing the control group participants to access the intervention following the completion of data collection.

The qualitative component of the study employed a phenomenological methodology to explore participants' subjective experiences and meaning-making processes related to the mCBT intervention. This approach is particularly appropriate for understanding the complex psychological and behavioral changes associated with digital therapeutic interventions, providing insights into the mechanisms underlying therapeutic effectiveness.

2.1 Participants and Setting

This study was conducted in Jakarta and the surrounding metropolitan areas of Indonesia between March and August 2023, targeting young adults during the post-COVID-19 recovery period. Participants were recruited through purposive and snowball sampling methods using social media platforms, university networks, and community health centers. The recruitment strategy was designed to ensure diversity in demographic characteristics, while focusing on the target population of interest.

Inclusion criteria required participants to be: (1) aged 18-25 years, (2) Indonesian citizens residing in the Jakarta metropolitan area, (3) experiencing mild to moderate anxiety and/or depression symptoms as evidenced by initial screening assessments, (4) having access to smartphone technology with internet connectivity, (5) able to participate in Indonesian language interviews, and (6) provision of informed consent for participation. Exclusion criteria were: (1) current participation in formal psychotherapy or psychiatric treatment, (2) severe mental health symptoms requiring immediate clinical intervention, (3) substance abuse disorders, (4) cognitive impairments affecting the ability to use mobile applications, and (5) pregnancy or major medical conditions.

A total of 25 participants were enrolled in the study following comprehensive screening procedures. The sample size was determined based on the qualitative research guidelines for phenomenological studies, which typically require 20-30 participants to achieve theoretical saturation. The demographic characteristics of the final sample included 15 females (60%) and 10 males (40%) with ages ranging from 18 to 25 years (mean age = 21.2 years). Educational background included bachelor's degree students (68%), diploma program students (20%), and master's degree students (12%).

2.2 Mobile CBT Intervention

The mobile CBT application used in this study was developed specifically for Indonesian young adults, incorporating culturally adapted CBT principles and evidence-based therapeutic techniques. The application featured six core modules: (1) psychoeducation about anxiety and depression, (2) cognitive restructuring exercises, (3) behavioral activation strategies, (4) mindfulness and relaxation techniques, (5) goal-setting and progress monitoring, and (6) relapse prevention planning.

Each module was designed to be completed over one week, with daily interactive exercises and practice opportunities. The application includes mood tracking, thought records, activity scheduling, guided meditations, progress visualizations, and personalized feedback mechanisms. The content was delivered through multimedia formats, including text, audio, video, and interactive exercises, to accommodate different learning preferences and enhance user engagement.

Cultural adaptations were integrated throughout the application content, including the use of the Indonesian language, culturally relevant examples and case studies, incorporation of local social and family contexts, and consideration of Indonesian values and belief systems. The development process involved collaboration with local mental health professionals, cultural consultants, and representatives of the target population to ensure appropriateness and relevance.

2.3. Data Collection Procedures

Data collection employed multiple qualitative methods to capture a comprehensive understanding of participants' experiences and intervention outcomes. The primary data collection methods included (1) in-depth semi-structured interviews, (2) focus group discussions, (3) digital diary entries, and (4) app usage analytics.

Semi-structured interviews were conducted at three time points: baseline (pre-intervention), mid-intervention (Week 3), and post-intervention (Week 6). Each interview lasted approximately 45-60 minutes and explored the participants' mental health status, app usage experiences, perceived benefits and challenges, and changes in

psychological well-being. Interview guides were developed based on established frameworks for digital health intervention evaluation and were adapted for the Indonesian cultural context.

Focus group discussions were conducted separately for the intervention and control groups at mid-point and post-intervention time points. Each focus group included 6-8 participants and lasted approximately 90 minutes, facilitating the exploration of shared experiences, peer interactions, and collective meaning-making processes. Focus groups are particularly valuable for understanding the social and cultural factors influencing intervention acceptance and effectiveness.

Digital diary entries were collected through a mobile application platform, allowing participants to provide real-time reflections on their experiences, challenges, and insights throughout the intervention period. This method captures immediate experiences and contextual factors that might have been forgotten or altered in retrospective interviews.

2.4 Qualitative Data Analysis

Qualitative data analysis followed established procedures for thematic analysis, incorporating both inductive and deductive coding. The analysis process began with data familiarization through the repeated reading of transcripts and initial note-taking. All interviews and focus groups were audio-recorded, transcribed verbatim in Indonesian, and translated into English for analysis, while maintaining cultural nuances and meanings.

Initial coding was conducted independently by two research team members using NVivo 12 software with regular meetings to discuss emerging codes and resolve discrepancies through consensus. The coding process involved a line-by-line analysis to identify meaningful units of data, followed by pattern recognition and theme development. Both semantic and latent themes were identified, capturing both explicit content and underlying meanings in the participant accounts.

Thematic analysis followed Braun and Clarke's six-phase approach: (1) familiarizing with data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. This systematic approach ensured rigor and transparency in the analytical process while allowing for emergent insights and unexpected findings.

Trustworthiness and credibility were enhanced through multiple strategies, including (1) triangulation of data sources and methods, (2) member checking with participants to validate interpretations, (3) peer debriefing sessions with research team members, (4) reflexive journaling throughout the analysis process, and (5) external audits by independent qualitative researchers. These measures helped ensure that the findings accurately represented the participants' experiences and maintained methodological rigor.

2.5 Ethical Considerations

This study was approved by the Institutional Review Board of the University of Indonesia (Protocol Number: 2023-03-IRB-001). All participants provided written informed consent prior to enrollment, with particular attention to confidentiality, voluntary participation, and the right to withdraw without penalty. Special considerations were implemented for mental health research, including protocols for identifying and referring participants who may require additional clinical support.

Privacy and data security measures were implemented throughout the study, including secure data storage, encrypted communications, and anonymous reporting of the findings. The participants were provided with mental health resources and emergency contact information, with regular monitoring for signs of psychological distress requiring immediate intervention. The research team included licensed mental health professionals who were available for consultation and referral services as needed.

Cultural sensitivity was maintained throughout all research procedures, with attention paid to Indonesian social norms, religious considerations, and family dynamics. The research team members included Indonesian nationals with a deep understanding of local cultural contexts and appropriate training in qualitative research methods.

3. RESULTS AND DISCUSSION

The qualitative analysis of this randomized controlled trial revealed comprehensive insights into the experiences of young adults using mobile application-based cognitive behavioral therapy in the context of the post-COVID-19 pandemic. Through a systematic thematic analysis of interview data, focus group discussions, and digital diary entries, six major themes emerged that illuminate the mechanisms and outcomes of the mCBT intervention among Indonesian young adults.

3.1. Participant Characteristics and Engagement

The final sample of 25 participants demonstrated diverse demographic characteristics that are representative of young Indonesian adults in urban settings. Table 1 presents the comprehensive demographic profile of the study participants, showing balanced representation across key variables, including age, gender, educational level, employment status, and perceived COVID-19 impact level.

Table 1. Participant Demographics and Characteristics (N=25)

Characteristic	Category	Frequency (n)	Percentage (%)
Age Range	18-20 years	10	40%
	21-23 years	11	44%
	24-25 years	4	16%
Gender	Female	15	60%
	Male	10	40%
Education Level	Diploma	5	20%
	Bachelor	17	68%
	Master	3	12%
Employment Status	Student	15	60%
	Working	10	40%
COVID Impact Level	High	10	40%
	Moderate	11	44%
	Low	4	16%

Participants' engagement with the mobile CBT application demonstrated high levels of utilization and satisfaction throughout the intervention period. Table 2 illustrates the comprehensive app usage patterns and user experience metrics, revealing consistent engagement across different features and high overall satisfaction ratings.

Table 2. Mobile app usage and User Experience patterns (N=25)

Usage Metric	Mean (SD)	Range	Frequency Distribution
Weekly Usage Hours	5.1 (0.8)	3.6-6.3	Low: 4 (16%), Moderate: 11 (44%), High: 10 (40%)
Engagement Level	-	-	Moderate: 12 (48%), High: 13 (52%)
User Satisfaction	-	-	Moderately: 4 (16%), Satisfied: 9 (36%), Very Satisfied: 12 (48%)

The most frequently used and helpful features included mood tracking (32% of participants), CBT exercises (24%), guided meditation (20%), goal setting (16%), and progress monitoring (8%). These patterns indicate a strong user preference for interactive and self-monitoring features that support ongoing therapeutic engagement and behavioral change processes.

3.2. Thematic Analysis Results

A comprehensive thematic analysis revealed six major themes that capture the multifaceted experiences of young adults using mobile CBT applications in the post-pandemic context. Table 3 presents a quantitative overview of that thematic analysis results, showing the frequency and coverage of each major theme across the participant accounts.

Table 3. Major Themes from Thematic Analysis (N=25)

Main Theme	Sub-Themes Count	Frequency Mentions	Participant Coverage (n)	Coverage Percentage (%)
Behavioral Change Process	6	92	24	96%
Digital Therapeutic Alliance	4	89	22	88%
Empowerment Through Technology	5	76	20	80%
Resilience Building	4	67	19	76%
Social Connection in Digital Space	3	54	15	60%
Challenges and Barriers	5	43	16	64%

3.2.1. Theme 1: Behavioral Change Process

The most prominent theme identified in the analysis was the Behavioral Change Process, mentioned 92 times by 24 participants (96% coverage). This theme captures participants' experiences of gradual psychological and behavioral transformation through systematic engagement with CBT techniques delivered via a mobile application. Participants described experiencing structured progression through different stages of change, beginning with awareness and recognition of maladaptive patterns, progressing through skill acquisition and practice, and ultimately achieving sustained behavioral modifications.

Participants consistently reported developing enhanced self-awareness regarding their thought patterns, emotional responses, and behavioral reactions to stressors. One participant noted, "The app helped me recognize when my thoughts were spiraling into anxiety. I learned to catch these patterns early and apply breathing techniques before they became overwhelming." This increased metacognitive awareness appears to serve as a foundation for subsequent therapeutic changes and skill development.

The cognitive restructuring components of the intervention were particularly salient in participant accounts, with many describing significant shifts in their thinking patterns and interpretations of stressful situations. Participants reported learning to identify and challenge negative automatic thoughts, developing more balanced perspectives, and implementing alternative coping strategies. The behavioral activation elements also proved highly effective, with participants describing increased engagement in meaningful activities, improved goal-setting skills, and enhanced motivation for positive behavioral changes.

The progressive nature of behavioral change was evident in participant narratives, with many describing initial skepticism, followed by gradual acceptance and eventual integration of CBT principles into daily life. The mobile platform appears to facilitate this progression by providing consistent reinforcement, immediate feedback, and flexible pacing that accommodates individual learning styles and schedules.

3.2.2. Theme 2: Digital Therapeutic Alliance

The Digital Therapeutic Alliance theme emerged as the second most prominent finding, with 89 mentions from 22 participants (88% coverage). This theme encompasses the participants' development of meaningful therapeutic relationships with the mobile application itself, characterized by trust, engagement, and perceived therapeutic benefit. Participants described experiencing a genuine connection with the digital platform, often anthropomorphizing the application and attributing therapeutic qualities to their interactions.

Participants frequently described the application as a reliable and non-judgmental companion that provided consistent support during difficult periods. One participant explained: "It felt like having a therapist in my pocket who was always available when I needed support. The app never judged me and always provided helpful suggestions." This perception of constant availability and non-judgmental support is crucial for maintaining engagement and therapeutic progress.

The personalization features of the application contributed significantly to the development of a therapeutic alliance with participants appreciating customized content, personalized feedback, and adaptive responses based on their progress and preferences. The interactive elements, including progress tracking and achievement recognition, enhanced the participants' sense of collaboration and partnership with the digital therapeutic tool.

Trust in the digital platform developed gradually but consistently across participants, with many reporting an initial skepticism that transformed into genuine appreciation and reliance on the application's guidance. Evidence-

based content and professional presentation of materials contributed to perceptions of credibility and therapeutic legitimacy.

3.2.3. Theme 3: Empowerment Through Technology

Empowerment Through Technology was identified as a significant theme, with 76 mentions from 20 participants (80% coverage). This theme captures participants' experiences of increased self-efficacy, autonomy, and control over their mental health through engagement with mobile CBT intervention. Participants described feeling empowered by having immediate access to therapeutic tools and strategies, which enabled them to take active roles in managing their psychological well-being.

The self-directed nature of the mobile intervention was particularly empowering for participants who appreciated their ability to progress at their own pace and access support when needed without scheduling constraints or external dependencies. Many participants reported increased confidence in their ability to manage anxiety and depression symptoms independently, with one stating, "I realized I had more control over my mental health than I thought. The app gave me practical tools I could use anytime, anywhere."

The educational components of the application significantly contributed to empowerment by providing participants with a comprehensive understanding of anxiety and depression, including symptoms, causes, and evidence-based treatment approaches. This psychoeducational element helped normalize the participants' experiences while providing hope and confidence in recovery possibilities.

The privacy and anonymity afforded by the mobile platform enhanced feelings of empowerment by removing the barriers related to stigma and social judgment. Participants reported feeling more comfortable exploring sensitive topics and practicing new skills in a private digital environment before applying them in real-world contexts.

3.2.4. Theme 4: Resilience Building

Resilience Building emerged as a substantial theme, with 67 mentions across 19 participants (76% coverage). This theme encompasses the participants' development of psychological resilience, adaptive coping strategies, and increased capacity to manage future stressors effectively. Participants described building robust mental health resources that extended beyond symptom reduction, to include enhanced stress tolerance and recovery capabilities.

The mindfulness and relaxation components of the application were particularly effective in building resilience, with the participants learning various techniques for emotional regulation and stress management. Many have reported developing daily mindfulness practices that provide ongoing protection against anxiety and depression symptoms. One participant noted: "The meditation exercises became part of my daily routine. They helped me stay calm and centered even when facing new stressors."

Problem-solving skills development was another crucial aspect of resilience building, with participants learning systematic approaches to address challenges and make decisions. The goal-setting features of the application supported this process by helping participants break down overwhelming problems into manageable steps and track their progress toward solutions.

Participants also described developing an increased tolerance for uncertainty and discomfort, particularly relevant in the post-COVID-19 context where ongoing uncertainty remained prevalent. The application's emphasis on acceptance and adaptive coping appeared to help the participants develop more flexible responses to unpredictable situations.

3.2.5. Theme 5: Social Connection in Digital Space

Social connections in the digital space were identified with 54 mentions across 15 participants (60% coverage). This theme captures participants' experiences of feeling less isolated and more connected to others through their engagement with the digital platform despite the individual nature of the intervention. Many participants reported that the application helped them feel part of a broader community of individuals working toward similar mental health goals.

The shared experience of using evidence-based therapeutic tools has created a sense of connection to the broader mental health community and treatment tradition. Participants appreciated knowing that they were utilizing the same techniques used in professional therapy settings, creating feelings of legitimacy and connection with established treatment approaches.

Some participants described sharing their experiences with family members and friends, which led to enhanced social support and understanding. The educational components of the application helped participants communicate more effectively about their mental health needs and treatment experiences through their support networks.

The reduction in feelings of isolation was particularly significant in the post-pandemic context, where many participants continued to experience social distancing effects and reduced in-person connections. The mobile application appeared to provide psychological connections and communities even in the absence of direct social interaction.

3.2.6. Theme 6: Challenges and Barriers

Challenges and Barriers represented the smallest but still significant theme with 43 mentions across 16 participants (64% coverage). This theme encompasses the various difficulties and obstacles participants encountered while using the mobile CBT application, providing important insights into areas for improvement and the potential limitations of digital therapeutic interventions.

Technical issues, including application crashes, connectivity problems, and UI difficulties, were the most commonly reported barrier. Table 4 presents a detailed breakdown of the specific challenges and barriers identified through interview analysis.

Table 4. Interview Themes Summary: Challenges and Positive Responses (N=25)

Theme Category	Positive Responses (n)	Negative Responses (n)	Key Quotes Count
Self-Paced Learning	24	1	18
Accessibility & Convenience	23	2	15
Privacy & Anonymity	22	3	12
Content Quality	21	4	16
Interactive Features	20	5	14
Personalization	19	6	11
Peer Support	18	7	10
Technical Issues	5	20	8

Despite these challenges, participants generally maintained positive attitudes toward the intervention and developed strategies to overcome obstacles. Many participants reported that the benefits of the application outweighed the difficulties, and most continued using the platform despite the technical problems.

3.3. Pre-Post Intervention Qualitative Changes

The analysis of pre- and post-intervention themes revealed significant qualitative changes in participants' psychological states and coping strategies. Table 5 presents representative examples of thematic shifts observed across the participant sample, illustrating the transformation from problematic to adaptive responses.

Table 5. Pre-post-intervention thematic changes (Sample of N=5)

Participant	Pre-Anxiety Theme	Pre-Depression Theme	Post-Anxiety Theme	Post-Depression Theme
P001	Social Isolation	Loss of Purpose	Improved Coping	Renewed Hope
P002	Career Uncertainty	Hopelessness	Better Planning	Increased Activity
P003	Health Concerns	Social Withdrawal	Reduced Worry	Social Reconnection
P004	Academic Stress	Low Self-Worth	Stress Management	Self-Acceptance
P005	Financial Worry	Grief	Acceptance	Meaning-Making

These qualitative transformations demonstrate the effectiveness of the mobile CBT intervention in facilitating meaningful psychological changes among the participants. The shift from maladaptive patterns to adaptive coping strategies reflects the core therapeutic mechanisms of CBT delivered through digital platforms.

The pre-intervention themes predominantly reflected common post-pandemic stressors including social isolation, uncertainty, health concerns, academic disruption, and financial insecurity. The post-intervention themes

showed consistent movement toward adaptive coping, including improved stress management, enhanced planning capabilities, increased acceptance, and a renewed sense of purpose and meaning.

These thematic changes align with the established CBT outcomes and demonstrate the successful translation of traditional therapeutic principles into effective digital interventions. The consistency of positive change across diverse participant backgrounds suggests the broad applicability and effectiveness of the mobile CBT approach for Indonesian young adults in the post-pandemic context.

3.4. Discussion

The findings of this randomized controlled trial provide compelling evidence for the efficacy of mobile application-based cognitive behavioral therapy interventions in addressing anxiety and depression symptoms among Indonesian young adults in the post-COVID-19 pandemic context. A comprehensive qualitative analysis revealed six major themes that illuminate the complex mechanisms underlying digital therapeutic effectiveness, offering valuable insights into both the processes and outcomes of mCBT interventions in this population.

3.4.1. Effectiveness of Mobile CBT Interventions

The prominent emergence of the Behavioral Change Process theme, mentioned 92 times across 96% of the participants, demonstrates the robust capacity of mobile CBT applications to facilitate meaningful psychological transformation. This finding aligns with previous research showing the significant effects of digital CBT interventions on anxiety and depression symptoms, with effect sizes ranging from small to moderate ($d = 0.19$ – 0.47). The systematic progression through awareness, skill acquisition, and behavioral modification observed in participant narratives reflects the successful translation of established CBT mechanisms into a digital format [12].

The high frequency of mentions of Digital Therapeutic Alliance (89 across 88% of participants) represents a particularly noteworthy finding, as therapeutic alliance has been consistently identified as a crucial predictor of treatment outcomes in traditional psychotherapy. The development of meaningful relationships with digital platforms challenges conventional assumptions regarding the necessity of human therapeutic relationships, suggesting that well-designed mobile applications can foster genuine therapeutic connections. This finding has significant implications for scaling mental health interventions in resource-constrained settings where human therapist availability is limited [13].

Empowerment Through Technology theme (76 mentions across 80% of participants) reflects a key advantage of mobile health interventions: the enhancement of user agency and self-efficacy in mental health management. This finding resonates with previous research highlighting the importance of patient empowerment in digital health interventions, and suggests that mobile CBT applications can effectively support autonomous self-care behaviors. The combination of accessibility, privacy, and immediate availability appears to create optimal conditions for young adults to actively engage in mental health care [14].

3.4.2. Cultural Adaptation and Contextual Factors

The successful implementation of mobile CBT interventions among Indonesian young adults demonstrates the potential for cultural adaptation of evidence-based digital therapeutic tools. The integration of Indonesian, culturally relevant examples, and consideration of local social contexts appeared to enhance intervention acceptability and effectiveness. This finding supports previous research emphasizing the importance of cultural sensitivity in digital mental health interventions and suggests successful strategies for adapting Western-developed therapeutic approaches for Southeast Asian populations [15].

The post-COVID-19 context has created unique opportunities and challenges for digital mental health interventions. Participants' experiences of social isolation, uncertainty, and disrupted traditional support systems create heightened receptivity to digital therapeutic solutions. Simultaneously, the pandemic-accelerated adoption of digital technologies for health purposes has reduced barriers to mHealth intervention acceptance. The Social Connection in Digital Space suggests that mobile applications can partially address pandemic-related isolation while providing therapeutic benefits [16].

The prominence of resilience-building themes (67 mentions across 76% of participants) appears particularly relevant in the post-pandemic context, where ongoing uncertainty and stress management remain critical concerns. The development of adaptive coping strategies and stress tolerance represents valuable preparation for future challenges, potentially providing long-term protective effects beyond immediate symptom reduction. This finding suggests that mobile CBT interventions may offer value during periods of collective trauma and recovery [17].

3.4.3. Mechanisms of Digital Therapeutic Change

Qualitative analysis provides valuable insights into the mechanisms underlying digital therapeutic effectiveness. The progression from initial skepticism to genuine therapeutic engagement observed across participants suggests that trust and credibility gradually develop through consistent positive interactions with the platform. The combination of evidence-based content, professional presentations, and personalized feedback appears crucial for establishing therapeutic legitimacy and maintaining user engagement [18].

The self-paced and privacy-enhanced nature of mobile interventions emerged as a key therapeutic mechanism, allowing participants to explore sensitive topics and practice new skills without social judgment or external pressure. This finding aligns with research that highlights the importance of reduced stigma and enhanced accessibility in digital mental health interventions. The ability to access support immediately when needed appears to provide psychological security that facilitates therapeutic risk-taking and behavioral change.

The integration of multiple therapeutic modalities within a single platform, including cognitive restructuring, behavioral activation, mindfulness, and psychoeducation, appears to create synergistic effects that enhance overall intervention effectiveness. The participants' ability to select and focus on personally relevant components while maintaining access to comprehensive therapeutic resources suggests that flexible modular approaches may optimize individual therapeutic outcomes [19].

3.4.4. Challenges and Implementation Considerations

The identification of technical issues as the primary barrier to intervention effectiveness (20 negative responses compared to five positive responses) highlights critical implementation considerations for mobile mental health applications. Connectivity problems, application crashes, and user interface difficulties can significantly undermine therapeutic engagement and effectiveness, particularly in resource-limited settings, where technical support may be unavailable. These findings emphasize the importance of robust technical development, comprehensive user testing, and ongoing technical support for successful mHealth implementation [20].

Despite technical challenges, the overwhelmingly positive response to core intervention features suggests that clinical effectiveness can be maintained, even in the presence of technical difficulties. The development of user resilience and problem-solving strategies to overcome technical barriers may represent an additional therapeutic benefit of mobile interventions, building general coping skills that extend beyond mental health applications [21].

The variation in engagement levels and feature preferences across participants highlights the importance of personalization and flexibility in mobile mental health interventions. While some participants preferred structured exercises and goal-setting features, others found greater benefits in the mindfulness and self-monitoring components. This diversity suggests that successful mobile CBT applications should offer multiple therapeutic pathways and allow users to customize their experiences based on individual preferences and needs [22].

3.4.5 Implications for Mental Health Service Delivery

The findings of this study have significant implications for mental health service delivery in Indonesia and similar contexts. The demonstrated effectiveness of mobile CBT interventions suggests the potential for scaling evidence-based mental health care to reach underserved populations, particularly young adults, who may face barriers to traditional therapy access. High levels of user satisfaction and engagement indicate a strong potential for sustained use and long-term therapeutic benefits [23].

The successful development of therapeutic alliances with digital platforms suggests that mobile applications can serve as valuable complements or alternatives to human-delivered therapy, particularly for mild-to-moderate mental health symptoms. This finding has important implications for addressing mental health workforce shortages and reducing treatment costs, while maintaining therapeutic effectiveness. However, the need for appropriate screening and referral systems for individuals requiring more intensive interventions remains crucial.

The post-pandemic context has created an unprecedented demand for accessible mental health services, with traditional delivery systems struggling to meet increased needs. Mobile CBT interventions offer scalable solutions that can provide immediate support when individuals await traditional services or serve as standalone interventions for appropriate cases. The demonstrated cultural adaptability suggests the potential for broad implementation across diverse Southeast Asian contexts with appropriate localization [24].

3.4.6. Methodological Contributions

This study makes important methodological contributions to the field of digital mental health research through a comprehensive qualitative approach for evaluating intervention effectiveness. The integration of multiple qualitative methods, including semi-structured interviews, focus groups, and digital diaries, provided a rich, multifaceted understanding of participant experiences that quantitative measures alone can not capture. The thematic analysis approach successfully identified key therapeutic mechanisms and processes that inform both the theoretical understanding and practical implementation of mobile CBT interventions [25].

The cultural adaptation and contextualization of research methods for Indonesian populations demonstrate successful strategies for conducting rigorous qualitative research in non-Western contexts. The integration of local cultural consultants, Indonesian language materials, and culturally appropriate research procedures provides a model for conducting respectful and effective cross-cultural mental-health research.

The mixed-methods approach, combining a randomized controlled trial design with comprehensive qualitative analysis, offers a robust framework for evaluating complex digital health interventions. This methodological integration provides evidence of the effectiveness and understanding of the underlying mechanisms, supporting both clinical decision-making and intervention improvement efforts.

4. CONCLUSION

This randomized controlled trial provides compelling evidence for the efficacy of mobile application-based cognitive behavioral therapy in reducing anxiety and depression symptoms among Indonesian young adults in the post-COVID-19 pandemic context. The comprehensive qualitative analysis revealed six major themes that illuminate the complex mechanisms underlying digital therapeutic effectiveness: the Behavioral Change Process, Digital Therapeutic Alliance, Empowerment Through Technology, Resilience Building, Social Connection in Digital Space, and Challenges and Barriers. These findings demonstrate that mobile CBT interventions can successfully facilitate meaningful psychological transformation through systematic engagement with evidence-based therapeutic techniques delivered via smartphone technology. The development of a therapeutic alliance with digital platforms, combined with enhanced user empowerment and resilience building, suggests that well-designed mobile applications can provide effective mental health support that extends beyond traditional symptom reduction, to include enhanced coping capabilities and stress management skills. The successful cultural adaptation of CBT principles for Indonesian young adults demonstrates the potential of scaling evidence-based digital mental health interventions across diverse populations and contexts. The post-pandemic setting created optimal conditions for digital therapeutic acceptance while highlighting the particular relevance of resilience-building approaches for managing ongoing uncertainty and stress. Despite technical challenges and implementation barriers, participants demonstrated high levels of engagement and satisfaction with the mobile CBT intervention, suggesting a robust potential for sustained use and long-term therapeutic benefits. The combination of accessibility, privacy, flexibility, and evidence-based content appears to create optimal conditions for young adults' engagement in mental health self-management.

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REFERENCES

- [1] J. N. Bress *et al.*, "Efficacy of a Mobile App-Based Intervention for Young Adults With Anxiety Disorders," *JAMA Netw. Open*, vol. 7, no. 8, p. e2428372, Aug. 2024, doi: 10.1001/jamanetworkopen.2024.28372.
- [2] N. K. Y. Anasuyari, M. Latifah, and L. N. Yuliati, "Adolescents' mental health during the COVID-19 pandemic: Do loneliness, family, and online friends matter?," *Humanit. Indones. Psychol. J.*, pp. 53–68, Feb. 2023, doi: 10.26555/humanitas.v20i1.32.
- [3] A. Malla and R. Joobar, "COVID-19 and the Future with Digital Mental Health: Need for Attention to Complexities," *Can. J. Psychiatry*, vol. 66, no. 1, pp. 14–16, Jan. 2021, doi: 10.1177/0706743720957824.
- [4] L. W. Chau, R. W. Lam, H. Minas, K. Hayashi, V. C. Nguyen, and J. O'Neil, "Digital Health Interventions for Depression and Anxiety in Low- and Middle-Income Countries: Rapid Scoping Review," *JMIR Ment. Heal.*, vol. 12, p. e68296, Aug. 2025, doi: 10.2196/68296.
- [5] A. L. Rathbone, L. Clarry, and J. Prescott, "Assessing the Efficacy of Mobile Health Apps Using the Basic Principles of Cognitive Behavioral Therapy: Systematic Review," *J. Med. Internet Res.*, vol. 19, no. 11, p. e399, Nov. 2017, doi: 10.2196/jmir.8598.
- [6] A. Ahmed *et al.*, "Thematic Analysis on User Reviews for Depression and Anxiety Chatbot Apps: Machine Learning Approach," *JMIR Form. Res.*, vol. 6, no. 3, p. e27654, Mar. 2022, doi: 10.2196/27654.
- [7] A. d'Arqom, M. Akram, N. S. Azzahrana, M. Z. Nasution, E. R. Surjaningrum, and J. Yusof, "Societal Influence and Psychological Distress Among Indonesian Adults in Java on the Early Omicron Wave of COVID-19," *Futur. Sci. OA*, vol. 9, no. 10, Dec. 2023, doi: 10.2144/fsoa-2023-0104.
- [8] E. L. Funnell *et al.*, "Learnings from user feedback of a novel digital mental health assessment," *Front. Psychiatry*, vol. 13, Oct. 2022, doi: 10.3389/fpsyt.2022.1018095.
- [9] E. Nugroho, A. A. Nisa, W. H. Cahyati, and N. Najib, "Perception, mental health, and social media exposure on adolescents in Indonesia during COVID-19 pandemic," *J. Pharm. Pharmacogn. Res.*, vol. 11, no. 3, pp. 426–436, May 2023, doi: 10.56499/jppres22.1560_11.3.426.
- [10] R. H. Ibrahim, M. H. Yaas, M. Q. Hamarash, S. H. Al-Mukhtar, M. F. Abdulghani, and O. Al Mushhadany, "Adapting Cognitive Behavioral Therapy for Adolescents in Iraq via Mobile Apps: Qualitative Study of Usability and Outcomes," *JMIR Pediatr. Parent.*, vol. 8, pp. e67137–e67137, Apr. 2025, doi: 10.2196/67137.
- [11] M. A. Marciniak *et al.*, "Development of Powerly, unguided mobile app intervention preventing postpartum depression and anxiety & study protocol of randomized clinical trial," *Internet Interv.*, vol. 41, p. 100843, Sep. 2025, doi: 10.1016/j.invent.2025.100843.
- [12] S. B. Goldberg, S. U. Lam, O. Simonsson, J. Torous, and S. Sun, "Mobile phone-based interventions for mental health: A systematic meta-review of 14 meta-analyses of randomized controlled trials," *PLOS Digit. Heal.*, vol. 1, no. 1, p. e0000002, Jan. 2022, doi: 10.1371/journal.pdig.0000002.

- [13] R. Taher, D. Stahl, S. Shergill, and J. Yiend, "The Safety of Digital Mental Health Interventions: Findings and Recommendations From a Qualitative Study Exploring Users' Experiences, Concerns, and Suggestions," *JMIR Hum. Factors*, vol. 12, p. e62974, Feb. 2025, doi: 10.2196/62974.
- [14] C. Oliveira, A. Pereira, P. Vagos, C. Nóbrega, J. Gonçalves, and B. Afonso, "Effectiveness of Mobile App-Based Psychological Interventions for College Students: A Systematic Review of the Literature," *Front. Psychol.*, vol. 12, May 2021, doi: 10.3389/fpsyg.2021.647606.
- [15] C. Zhu, T. Zhang, Q. Li, X. Chen, and K. Wang, "Depression and Anxiety During the COVID-19 Pandemic: Epidemiology, Mechanism, and Treatment," *Neurosci. Bull.*, vol. 39, no. 4, pp. 675–684, Apr. 2023, doi: 10.1007/s12264-022-00970-2.
- [16] T. J. Philippe *et al.*, "Digital Health Interventions for Delivery of Mental Health Care: Systematic and Comprehensive Meta-review," *JMIR Ment. Heal.*, vol. 9, no. 5, p. e35159, May 2022, doi: 10.2196/35159.
- [17] J. Burkauskas, I. Branchi, S. Pallanti, and K. Domschke, "Anxiety in post-covid-19 syndrome – prevalence, mechanisms and treatment," *Neurosci. Appl.*, vol. 3, p. 103932, 2024, doi: 10.1016/j.nsa.2023.103932.
- [18] A. Lan *et al.*, "Review of cognitive behavioural therapy mobile apps using a reference architecture embedded in the patient-provider relationship," *Biomed. Eng. Online*, vol. 17, no. 1, p. 183, Dec. 2018, doi: 10.1186/s12938-018-0611-4.
- [19] C. Tudor-Sfetea *et al.*, "Evaluation of Two Mobile Health Apps in the Context of Smoking Cessation: Qualitative Study of Cognitive Behavioral Therapy (CBT) Versus Non-CBT-Based Digital Solutions," *JMIR mHealth uHealth*, vol. 6, no. 4, p. e98, Apr. 2018, doi: 10.2196/mhealth.9405.
- [20] T. Munteanu, L. Kannis-Dymand, P. Millear, and M. Jones, "Analysis of cognitive behavioural therapy apps for generalised anxiety disorder: Evidence-based content and user experience," *Cyberpsychology J. Psychosoc. Res. Cybersp.*, vol. 18, no. 4, Sep. 2024, doi: 10.5817/CP2024-4-6.
- [21] C. Chang, E. Palermo, S. Deswert, A. Brown, and H. J. Nuske, "Money can't buy happiness: A randomized controlled trial of a digital mental health app with versus without financial incentives," *Digit. Heal.*, vol. 9, Jan. 2023, doi: 10.1177/20552076231170693.
- [22] E. R. Watkins *et al.*, "Emotional competence self-help app versus cognitive behavioural self-help app versus self-monitoring app to prevent depression in young adults with elevated risk (ECoWeB PREVENT): an international, multicentre, parallel, open-label, randomised controlled," *Lancet Digit. Heal.*, vol. 6, no. 12, pp. e894–e903, Dec. 2024, doi: 10.1016/S2589-7500(24)00148-1.
- [23] S. Nagamitsu *et al.*, "Usefulness of Interventions Using a Smartphone Cognitive Behavior Therapy Application for Children With Mental Health Disorders: Prospective, Single-Arm, Uncontrolled Clinical Trial," *JMIR Form. Res.*, vol. 9, pp. e60943–e60943, Jul. 2025, doi: 10.2196/60943.
- [24] S. Tan, M. A. Bin Ismail, T. I. M. Daud, R. Hod, and N. Ahmad, "A randomized controlled trial on the effect of smartphone-based mental health application among outpatients with depressive and anxiety symptoms: A pilot study in Malaysia," *Indian J. Psychiatry*, vol. 65, no. 9, pp. 934–940, Sep. 2023, doi: 10.4103/indianjpsychiatry.indianjpsychiatry_240_23.
- [25] M. Naeem, W. Ozuem, K. Howell, and S. Ranfagni, "A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research," *Int. J. Qual. Methods*, vol. 22, Oct. 2023, doi: 10.1177/16094069231205789.