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The feasibility study of Brief Cognitive Behavioral Therapy based on mobile apps in overcoming anxiety in young adults' Balinese rural area: Mixed methods study

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ABSTRACT

Background: During the COVID-19 pandemic in 2022, a preliminary investigation found an increase in untreated anxiety symptoms among young people in rural Bali due to isolation and economic uncertainty. This highlights the need for accessible interventions, such as Brief-Cognitive Behavioral Therapy (B-CBT), which is effective but limited in availability in areas with scarce mental health resources.

Purpose: This study aimed to develop and evaluate the feasibility of a mobile-based intervention, Mobile Brief-Cognitive Behavioral Therapy (MB-CBT), to help young adults in rural Bali manage anxiety symptoms, focusing on its usability, effectiveness, and community acceptance.

Method: A mixed-methods approach was employed to test the feasibility and usability of the MB-CBT prototype. Quantitative assessments included the System Usability Scale (SUS) and pre- and post-intervention measures of anxiety and stress using the Generalized Anxiety Disorder Scale (GAD-7) and the Perceived Stress Scale (PSS). Content validation was performed through semi-structured interviews with participants to assess the relevance and clarity of the app's content.

Findings: The MB-CBT intervention significantly reduced anxiety ($p \leq 0.002$) and perceived stress ($p \leq 0.000$) among participants. The System Usability Scale (SUS) score was 74.5, indicating good usability and high community acceptance. Content validation through interviews indicated that participants found the app's content highly relevant and user-friendly, with a very good level of content validity.

Implication: The findings indicate that MB-CBT is an effective and feasible tool for managing anxiety and stress in young adults in rural Bali. The high usability score and positive content validation suggest potential for expanding digital mental health interventions to other underserved areas. Healthcare providers should integrate mobile-based CBT into mental health programs to meet the growing demand for accessible resources.

KEYWORDS
Brief cognitive; behavioral therapy; anxiety; perceived stress; support group; early adults; digital mental health; well-being, rural area

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Introduction

Anxiety disorders are among the most prevalent mental health conditions worldwide, particularly affecting young adults. The World Health Organization (WHO) reports that anxiety disorders are the most prevalent mental health conditions worldwide, and increased approximately 25% of the population each year after COVID-19 pandemic (WHO, 2022). Among young adults, the prevalence tends to be even higher, as this group often faces significant life transitions, including academic pressures, social challenges, and increasing responsibilities, all of which contribute to stress and anxiety (Adams et al., 2022). In the 2020 study by American College Health Association about 60% of university students reported experiencing overwhelming

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anxiety which significantly interfered with their daily functioning and academic performance (American College Health Foundation, 2020). These conditions can lead to long-term negative outcomes, such as impaired social and academic functioning, substance abuse, and a higher risk of developing other mental health disorders, including depression (Kessler et al., 2005; Tan et al., 2023). The anxiety conditions among young adults worsen during COVID-19 pandemic particularly those in low-resource settings, often lack access to appropriate mental health care, making it essential to explore innovative and accessible interventions (Daly & Robinson, 2021).

This condition is also prevalent in the rural areas of Bali. Bali, known for its vibrant culture and tourism-driven economy, has seen significant economic and social changes in recent decade. While urban areas like Denpasar and Ubud have access to mental health resources, rural regions in Bali face considerable challenges (Asril et al., 2022; Yuniti et al., 2020). These rural areas often experience higher levels of poverty, social isolation, and limited access to healthcare, which can exacerbate mental health conditions, including anxiety (Yuniti et al., 2020). COVID-19 further exacerbated these challenges, with many individuals experiencing economic uncertainty, loss of income, and reduced socialization due to lockdowns and travel restrictions (Hermawan, 2020). These stressors particularly impacted young adults in Bali's rural areas, who faced disruptions in education, limited job opportunities, and an overwhelming sense of vulnerability due to the pandemic's uncertainty (Yuniti, et al., 2020).

The initial study conducted in May-June 2022 in rural regions of Bali, targeting 683 young adults aged 18 to 30, revealed that 63% of them reported experiencing mild anxiety, while 11.3% reported experiencing high anxiety due to the unmet conditions of the COVID-19 pandemic (Asril et al., 2022). The pandemic-induced 58% employment losses, reduced 37% socialization possibilities, and 5% the impression of vulnerability to COVID-19 triggered the anxiety symptoms (Asril et al., 2022). Despite growing recognition of mental health issues in Indonesia, stigma related to mental health remains a significant barrier to seeking treatment in Bali (Valentina & Nurcahyo, 2023). Mental health disorders, particularly anxiety in Bali, are often associated with shame, leading many individuals to avoid seeking professional help (Yuniti et al., 2020). Moreover, studies by (Ernst et al., 2023), Woodward & Fergusson (2001), Chiu et al., (2016), Ferdinand & Verhulst (1995), Kandasamy and Campbelll (2019), Hill et al., (2016), Walder et al., (2023), LeBlanc et al., (2020) and Ranira et al., (2023) indicate that anxiety often persists throughout adulthood if untreated in early adulthood. This chronic anxiety puts individuals at a higher risk of developing anxiety, depression, and substance misuse, as found by Swendsen et al., (2010) and Aquin et al., (2017). The findings of focus group discussions attended by 15 villagers in Bali in July 2022, attributed the untreated anxiety to the limited availability of mental health services in the communities. The reason is that mental health services in Indonesia primarily prioritize big cities that are not included in the national insurance coverage.

Research has demonstrated that cognitive behavioral therapy (CBT) is effective in addressing anxiety disorders (Beidas & Kendall, 2010; Beidas, 2012; Cully et al., 2012; Kendall, 2012; Beidas et al., 2013;Mignogna et al., 2014; Angelosante et al., 2014; James et al., 2015; Kaczkurkin & Foa, 2015) and is considered the recommended initial treatment for children and young adults (Chavira et al., 2004; Lunkenheimer et al., 2020). Research has shown that Cognitive Behavioral Therapy (CBT) is capable of alleviating symptoms of depressive disorders in individuals who have long-term physical illnesses (Lu et al., 2022; Oliveira et al., 2021; Rathbone et al., 2017). Nevertheless, Cognitive Behavioral Therapy (CBT) often has a prolonged duration, leading to a significant likelihood of patient attrition. Therefore, Brief Cognitive Behavioral Therapy (B-CBT) was created. B-CBT refers to compressing CBT material and reducing the average number of sessions from 12-20 to four to eight sessions. CBT focuses on targeted interventions for a select few of the patient's issues in a concise manner. The treatment necessitates specificity due to the restricted number of sessions (Cully, 2020). In addition, the patient is advised to diligently utilize supplementary reading materials and tasks to help their therapeutic progress. Problems that can be effectively addressed by short-term Cognitive Behavioral Therapy (CBT) include, but are not limited to adjustment, anxiety, and depressive disorders.

Nevertheless, there is a scarcity of reports regarding the efficacy of B-CBT utilization among young adults residing in rural areas of Indonesia. This is primarily attributed to the inadequate availability of mental health services, such as psychologists, psychiatrists, and therapists, who are predominantly concentrated in urban areas and not covered by the national insurance (Bali Central Bureau of Statistics, 2023). There are significant disparities in mental health literacy among those who are actively engaged in the healthcare system across different locations in Indonesia (Munira et al., 2023). The allocation and provision of rules and assistance for mental health professionals continue to present difficulties (Hartini et al., 2018).

Mobile-based B-CBT (MB-CBT) has the potential to address the mental health care gap and provide prompt treatment for individuals with co-morbid mental burdens. The benefits of mobile-based therapies include the ability to adapt to different times and locations, easy access for many people, the assumption of being cost-effective, and the ability to address psychological elements of chronic diseases with little barriers (Attkisson & Zwick, 1982; Feeley et al., 2009; Marchand et al., 2011; Lindhiem et al., 2015; Cossette et al., 2016; Lan et al., 2018; Betthauser et al., 2020; Pedersen et al., 2023). MB-CBT is specifically developed as a self-help technique. Multiple recent systematic reviews and meta-analyses suggest that cognitive behavioral therapy (CBT) delivered using mobile apps is especially effective when accompanied by therapeutic guidance (Beidel et al., 2000; Ly et al., 2014; Boswell et al., 2017; Oh et al., 2020; Malik et al., 2021). Mobile-based, therapeutically guided Cognitive Behavioral Therapy (CBT) can be just as effective as in-person CBT for treating mental disorders (Arjadi et al., 2018). Lunkenheimer et al., (2020) indicate that MB-CBT has the potential to be effective, safe, and cost-efficient.

CBT therapies for adult populations, delivered over the internet or mobile platforms, are predominantly available in the English language (Moreno et al., 2019a; Sujarwo et al., 2019). Regarding mobile apps for cognitive behavioral therapy (CBT) in young adults, the available evidence is rather limited. However, existing research indicates that mobile apps using cognitive-behavioral therapy (CBT) can effectively treat anxiety and depression in young adults. Guided mobile apps that use CBT may have a greater impact than self-help mobile apps that do not. Nevertheless, the writer has not encountered any information regarding the availability and efficacy of MB-CBT for young adults in Indonesia.

The current study would implement MB-CBT as an intervention for young adults in rural areas in Bali with the Indonesian language. This study developed based on the manual of B-CBT for anxiety and depression from Cully, et al. (2012) and derived from the Treatment Plan for Adolescent Anxiety by Jongsma et al., (2000). B-CBT condenses CBT material, reducing the typical 12-20 sessions to four to eight sessions. The patient is instructed to diligently utilize supplementary reading materials and assignments to facilitate therapeutic development. Despite challenges for the accessibility of mental health service in rural areas in Bali, mobile phone ownership in Bali is widespread, including in rural areas (Indonesia Central Bureau of Statistics, 2024). As of 2024, more than 99.25% of the population in Bali had access to mobile phones, and smartphones are increasingly common with 3G connection in rural areas (Indonesia Central Bureau of Statistics, 2024). Consequently, the establishment of telemedicine for the rural population in Bali was feasible. The intervention would consist of 8 scheduled in-person sessions, utilizing recordings and text to guide the exercises. Participants will be expected to engage in around 15-20 minutes of daily home practice using mobile applications. The applications were built with Balinese culture in mind, so several therapy tasks involve examples of daily life in Bali and the icons use *canang* as a prayer media and frangipani flowers, which are typical of Bali.

The primary objective of the present investigation is to create a mobile application-based cognitive behavioral therapy (MB-CBT) specifically designed for young adults residing in rural regions of Bali. The goal is to assist them in effectively managing and reducing their anxiety levels. The research questions of this study were:

1. Can the MB-CBT program be feasibly adopted into the into rural Indonesian practice to allow scale-up?
2. Does the MB-CBT lessen participants' reported symptoms of stress and anxiety?
3. Can the MB-CBT program be implemented as intended during the study?

Method

Study Design 1 Procedure: The Implementation study

The study design 1 employed a qualitative study design to examine the implementation of MB-CBT for young adults exhibiting mild anxiety symptoms in rural Bali. This study will utilize a semi-structured interview with two clinical psychologist who certified in CBT to investigate the content validity test and obstacles to the intervention. The analysis of the System Usability Score (SUS) employed the calculated SUS score, which ranged from 0 to 100 (Braun & Clarke, 2006; Suria, 2024).

The researchers conducted the study from February to September 2023. The researchers employed a qualitative methodology in conducting this study to enhance he validation of the design outcomes, ensuring that the designs align with the requirements of promotive, preventative, and monitoring initiatives for anxiety in young people. All participants in this study have utilized the MB-CBT application and possess a high level of technological proficiency.

The researchers identified the problem through a comprehensive review of existing literature. Furthermore, the authors examined various mental health apps that specifically targeted teleconsulting services, meditation, and mindfulness. The selection of these apps was done using purposive sampling methods. When creating an application, considerations for user experience (UX) encompass elements such as social interaction and accessibility. Users of mental health mobile technology perceive social connection and accessibility as important features of user experience (UX) (Lu et al., 2022). The researchers performed a design demonstration and administered readability tests of application to 5 participants from diverse backgrounds who were the potential users, who had experienced mild anxiety with a GAD-7 score of 14 or higher. This was done to verify that the application, which would be distributed in the subsequent stage, would be comprehensible to all participant groups.

Study Design 2 Procedure: The Efficacy test

The researchers employed the quantitative research method to test the efficacy of study. This subsequent phase entailed a demonstration of application among the participants. Initially, the researchers devised a questionnaire to evaluate the usability framework. The efficacy test stage comprised 10 participants who were young adults aged 18 to 25 years and had experienced stress or anxiety. These subjects were also included to assess the effectiveness of the MB-CBT on smartphones.

Instruments

The questionnaires collected quantitative data regarding the framework utilized, specifically the SUS framework. The SUS framework employed a 5-point Likert scale, with "strongly disagree" assigned a value of 1 and "strongly agree" assigned a value of 5. The efficacy of MB-CBT was evaluated using the Generalized Anxiety Disorder scale (GAD-7) and the Perceived Stress Scale (PSS). The GAD-7 is a concise and user-friendly self-administered anxiety scale. The initial participants of this examination were individuals receiving medical treatment in primary healthcare settings (Spitzer et al., 2006; Mossman et al., 2017; Adjorlolo, 2019; Casares et al., 2024). The GAD-7 is a versatile tool that can be applied in several contexts (Moreno et al., 2019b). The ratings span from 0 to 3. A score of 0 represents a complete absence, whereas a score of 3 signifies a frequency of nearly every day. The ratings will increase in proportion to the severity of worried symptoms. The Perceived Stress Scale (PSS) (Roberti et al., 2006; Taylor, 2015; Perera et al., 2017; Harris et al., 2023) will be utilized to assess the manifestations of stress. The whole 10-item questionnaire assesses subjective stress. The scale measures the level of distress a patient perceives in a given event.

Participants

The inclusion criteria for participants in the implementation study were certified psychologists with experience in Brief Cognitive Behavioral Therapy (CBT). The inclusion criteria for participants in the efficacy study were young adults aged 18 to 25 years who had experienced

mild anxiety, indicated by a GAD-7 score of 14 or higher, possessed a mobile phone with internet connectivity, and consented to complete the informed consent form. The exclusion criteria included individuals who did not consent to complete the informed consent form and those who had experienced severe anxiety.

Analysis Methods

The content analysis was employed to analyze the semi-structured interview in order to assess the acceptability of the MB-CBT. The validity test analyzed the estimated SUS score, which varied from 0 to 100. The SUS results were derived from measurements conducted by Bangor et al and utilized measurement ranges to ensure the results were comprehensible. The acquired findings were utilized to ascertain the degree of contentment with the design. The quantitative validity test was conducted with the Gregory (2000) formula. This approach is implemented by combining the evaluations of the two validators. An analysis of variance (ANOVA) was used to examine the GAD-7 and PSS scores in the subjects.

Ethical Clearance and Consent For Participation

All methodologies employed in this study, which include human subjects, adhere to the principles outlined in the 1964 Helsinki Declaration and the ethical criteria issued by the research committee at Universitas Pendidikan Ganesha. This study protocol has obtained institutional review board approval from Universitas Pendidikan Ganesha (1828/UN48.16/LT2022). Additionally, it has been registered in a public database (Chinese Clinical Trial Registry) with the registered number ChiCTR2300068935. The registry can be accessed at https://www.chictr.org.cn/showprojEN.html?proj=190454. Participation in the activity necessitates the provision of written, electronic, informed permission from all individuals involved. With the exception of persons who are at risk or in need of assistance, all participant data will be maintained as confidential. Participants are free to withdraw from the study at any point without having to provide a reason.

Intervention Procedures

The intervention in this study can be summarized as follows: psychoeducation, skill training (including affect recognition, cognitive restructuring, relaxation, and problem solving), and exposure to feared stimuli (Crawley et al., 2012). Behavioral activation (BA) is the main therapeutic element of the intervention, known for its simplicity and effectiveness in lowering feelings of anxiety (Cuijpers et al., 2007; Ekers et al., 2014; Afaq et al., 2021). Additionally, it may be administered digitally with minimal guidance (Ly et al., 2014). Prior studies (Arjadi et al., 2018; Bolton et al., 2014) have shown that lay health providers may administer BA both in person and digitally to effectively alleviate symptoms of anxiety, depression, and PTSD.

The MB-CBT program instructs users in specific strategies with daily example related to Balinese activities to reduce anxiety symptoms through a series of illustrated sessions with audio and video. A central protagonist presents a cohesive narrative that structures the sessions. This character facilitates the user's navigation through the intervention content by providing interactive, supportive, and culturally sensitive guidance. In addition, the applications were developed with cultural sensitivity in mind. The materials are enhanced by the integration of the local Balinese icon *canang* and frangipani flower context in the applications to increase users' familiarity with the content. This would enhance the trust and engagement in the applications (Hilty et al., 2020).

Users underwent a total of 8 therapy sessions, with an average duration of 15 to 30 minutes per session, resulting in a total treatment time of 6 hours. The treatment materials, derived from the Treatment Plan for Adolescent Anxiety by Jongsma et al., (2000) and Cully et al., (2012), initially concentrate on instructing young adults in coping skills. Subsequently, they offer these individuals the chance to apply and refine these abilities through exposure exercises.

Table 1.
MB-CBT session overview

Session and their objectives.
Session 1 : Introduction and Psychoeducation Intervention
- CBT Introduction.
- Give user an overview of the program and its purpose.
- Cycle of anxiety.

Session 2 : Journaling
- Teach user way to observe and release the thought patterns they have daily.
- Teach user how to be aware of their emotion in their daily activity.
- Teach user how to writing the journal about their emotion and thought.

Session 3 : Relaxation
- Teach user to practice relaxation based on deep breathing techniques.

Session 4 : Grounding Technique
- Teach user to practice grounding exercise to help redirect their though away from their distracting feeling and back to the presents.

Session 5 : Worry Exploration
- Teach user how to have conversation about their worries.
- Teach user how to structure worry time.
- Teach user how to cope with bedtime worries.

Session 6 : Healthy and Unhealthy Coping Strategies
- Teach user to recognize their coping strategies and changing unhealthy coping strategies to healthy coping strategies.
- Teach user to learn about the consequences about the unhealthy coping strategies.
- Teach user to recognize the barrier to use healthy coping strategies.

Session 7 : Thought Record
- Teach user to practice this tool to help them recognize and change unhelpful thought.
- Teach user to form a habit to paying attention to their thought and working to change them.
- Teach user to identify cognitive distortion and over suggestion for reframing thought.

Session 8 : End Session
- Review the skills that user learn from the treatment and asks user to practice the skills.
- Teach user about the warning sign of the anxiety symptoms.
- Teach user to prevent the relapse.

Result

Based on user test results using the GAD-7 instrument, the MB-CBT focuses on mental health interventions, particularly anxiety at mild and moderate levels. The MB-CBT recommends contacting a psychologist or psychiatrist on an emergency basis for high levels of anxiety. The app provides an eight-part anxiety management activity plan that users can follow progressively. In addition, the app offers several features to enhance users' mental health, as detailed in Appendix 1. These features include:

1. Test anxiety
   The GAD-7 instrument, comprising seven questions, conducts the anxiety test in less than ten minutes. This is the first step to determine the user's condition.
2. Identify test results
   User anxiety conditions are divided into four categories, namely, mild, moderate, minimal and severe. Conditions of mild and moderate anxiety will be directed to follow an Activity Plan that can relieve anxiety on a regular basis. Minimal anxiety conditions will be

directed to accessing anxiety information. Severe anxiety conditions will be directed to contact a psychologist who can provide immediate treatment.

3. Activity plan
   This activity plan is designed to help reduce anxiety conditions users gradually. This activity is created in the form of media including writing, images, sound and video that can be played repeatedly. These eight activity plans are:
   1) Psychoeducational intervention: Cycle of anxiety
   2) Journaling and mood tracking
   3) Deep breathing relaxation
   4) Relaxation grounding technique
   5) Worry exploration
   6) Healthy and unhealthy coping strategies
   7) Thought record
   8) Relapse prevention: look it up
   9) End session
4. Contact a psychologist
   This resource provides contacts for psychologists and psychiatrists affiliated with MB-CBT, who can serve as emergency handlers if the user is experiencing severe anxiety and requires assistance
5. Mood tracker
   A feature to help users recognize the dominant emotions and feelings experienced that day. Meanwhile, the mood/mood categories that can be selected are; smiling, angry, thinking, surprised, gloomy, happy, scared, crying, and unimpressed. To help with visualization, there is an image with various expressions according to the mood. The MB-CBT will store this mood data and make an analysis of the moods most frequently felt during the last month as an evaluation tool that can be used by users.
6. Journal
   The journal feature helps users to describe the user's emotions and feelings on the day with several helper questions, such as, "What good things happened today?", "What memories do you want to remember about today?", "What unpleasant things happened?" what happened today?", and "How did you overcome this unpleasant thing?". Through this feature, users are expected to be able to recognize and analyze things that cause the emotions they feel. So that in the future, behavior that gives rise to positive emotions can continue to be maintained.
7. Relaxation
   This feature contains several relaxation techniques in audio and text form that can be accessed at any time. Meanwhile, the relaxation techniques in question are Deep Breathing, Muscle Relaxation, and Grounding Technique.

After the application is released, a module validation test is carried out by psychology experts, and lecturers to help provide assessments and input that will become the basis for future development of this application. We asked for help from two validators with psychology backgrounds who are experts in their field of knowledge (see table 2). The content validity coefficient of the instrument is obtained with a value of 1, which means Very High.

Table 2.
Demographic characteristics of the validators

Demographic Characteristics	Results (n)
Gender	
Female	2
Male	0
Age (years)	
<17	0
17-30	2

Table 2.
Demographic characteristics of the validators

Demographic Characteristics	Results (n)
Occupation	
High school student	0
College student	0
Psychologist	2
Doctor	0
Others	0

Table 3.
Validity test of the MB-CBT

		Appraiser 1	
		Less relevant (score 1-2)	Very relevant (score 3-5)
Appraiser 2	Less relevant (score 1-2)	-	-
	Very relevant (score 3-5)	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

Note: Content Validity = $\frac{18}{18}$ = 1

Apart from carrying out validation tests from the side of psychology experts. We also carry out tests on the technology readiness side. The test was carried out with the aim of finding out the level of ease for new users in using the application. Testing was carried out using SUS (System Usability Scale) with five participants aged between 17-25 years and from several villages in Bali (see table 4). Participants have the same characteristics as trial users.

Table 4.
Demographic characteristics of the participants who completed SUS

Demographic Characteristics	Results (n)
Gender	
Female	3
Male	2
Age (years)	
17-25	5
Occupation	
College student	5

Table 5.
SUS score value

SUS Score	Grade	Information
>80,3	A	*Excellent*
68-80,3	B	*Good*
68	C	*Okay*
51-68	D	*Poor*
<51	F	*Awful*

Table 6.
Bali Sujati SUS score

Participants	SUS Score	Grade	Information
P1	85	A	*Excellent*
P2	65	C	*Okay*
P3	70	B	*Good*
P4	70	B	*Good*
P5	82.5	A	*Excellent*
Average	**74.5**	**B**	***Good***

Based on the scores from the SUS test above (table 5 and 6), it can be concluded that the MB-CBT application has appropriate features and meets the usage criteria, including being easy to learn, understand and use. Next, we conducted an analysis test to determine the effectiveness of using the MB-CBT for treating anxiety in limited subjects (N=10, see table 7). Meanwhile, participants were young adults aged 18-25 years who came from rural areas in the Bali Province region. All participants were asked to complete the pre-test and post-test four weeks later. During these four weeks, the participants was given intervention which was accessed via the MB-CBT on their smartphones. There were variables analyzed in the pre-test and post-test, namely GAD-7 and PSS. Data analysis was carried out using the one-way ANOVA method and using SPSS 24.0 statistical software.

The results of the analysis showed that all the participants passed the homogeneity test (>0.05), so the one-way ANOVA test could be continued. The results of the one-way ANOVA analysis showed that there were significant differences between the pre-test and post-test on the two variables measured in the participants. This means that the treatment and intervention model designed in the MB-CBT has an impact on reducing stress and anxiety. The following are the results of analysis tests on each variable (see table 8).

Table 7.
Demographic characteristics of the experiment group

Demographic Characteristics	Results (n)
Gender	
Female	7
Male	3
Age (years)	
17-25	10
Occupation	
College student	5
Others	5

Table 8.
One way anova significance value

Measure	Pre-test M (*SD*)	Post-test M (*SD*)	*F*	*p*	η^2
Perceived stress	28.4 (5.2)	20.1(4.8)	34.15	.000 (<.001)	.56
GAD-7 (anxiety)	15.2 (4.5)	9.3 (4.1)	18.72	.002 (<.005)	.41

Apart from the one-way ANOVA test, we also conducted a feasibility test on 10 people who were used the MB-CBT. The feasibility test aims to see the acceptance of the MB-CBT in the community. There were 12 questions asked to participants. We used a 1-5 Likert scale (1 = Very Unsuitable and 5 = Very Appropriate) for each question. The results of the analysis are shown in table 9 below. From the results of the feasibility study analysis, 48.33% of participants considered the MB-CBT

to be very suitable for application in society, 47.92% considered the MB-CBT to be suitable for implementation, the remaining 3.75% considered the application proposed to be quite suitable. The results of this analysis show that the MB-CBT can be accepted by the community and is suitable for application on a wider scale.

Table 9.
MB-CBT feasibility test

	Very suitable	In accordance	Suitable enough	Not Appropriate	Very Inappropriate
Percentage	48.33%	47.92%	3.75%	0%	0%

Result

Principal Findings

The Brief CBT has proven effectiveness, its traditional delivery method, which are not always feasible for individuals in rural or low-resources areas. In these regions, the geographical isolation, economic constraints, and limited access to qualified mental health professionals often make face-to-face therapy a challenge. Therefore, the development of mobile-based mental health interventions (MB-CBT) presents a promising solution.

The study to created mobile-based interventions (MB-CBT) offer several advantages, especially for populations living in rural or remote are. The first advantage is mobile apps were widely accessible, especially in rural Bali, where smartphone penetration is high. A 2019 report by the Indonesian Ministry of Communication and Information highlights that mobile phone ownership in Indonesia is nearly universal, including in rural areas (Indonesian Ministry of Communication and Information, 2019). Mobile apps provide an opportunity to reach people who may otherwise have limited access to mental health care. The second advantages were mobile apps allow individuals to access therapy or self-help interventions at their convenience (Lunkenheimer et al., 2020). Young adults, particularly in rural areas, may face barriers to attending in-person sessions, such as transportation issues and time constraints due to education commitments. Next, the third advantages were for young adults in cultures where mental health issues are still stigmatized, using a mobile app allows them to engage in therapy anonymously. This can be particularly important in rural settings, where people may feel hesitant to seek traditional therapy due to cultural norms or fear of judgement (Suryani & Jensen, 1992). Other advantages were related to the financial constraints in rural areas, mobile apps offer an affordable way to deliver evidence-based interventions like B-CBT (Arjadi et al., 2018). This is especially important for individuals working in the informal sector who may not have health insurance or the financial means to pay for private mental health care (Graham et al., 2020).

This study also created and constructed a prototype of an application for those experiencing symptoms of anxiety, customizing it to meet the specific requirements of the users. In order to develop an application, information is gathered to ascertain the requirements and issues faced by the users. Based on the feedback received from the participants, there was a lack of variation in the feature requirements across the respondents. Therefore, the design of this app has the potential to offer assistance to both mental health patients and healthcare professionals. Wang et al., (2018) and Torous et al., (2018) suggest that mental health applications have the potential to improve the monitoring and treatment of mental health symptoms or illnesses.

The mental health app offers several potential direct advantages, including the prevention of more severe illnesses, increased utilization of psychiatrists, enhanced competition among service providers leading to reduced treatment expenses, decreased operational costs for psychiatrists, fewer instances of missed appointments, and revenue generation for app developers (Powell et al., 2017). In addition, Wang et al (2018) mentioned potential secondary

advantages of utilizing mental health applications, including higher physical well-being, increased present and future efficiency, and less burden on caregivers. Medical workers in this study emphasized that the utilization of the mental health app facilitated the conduct of consultation sessions. The software can generate reports by analyzing the user's recorded activity.

Additionally, this study discovered that MB-CBT characteristics may be categorized into primary and secondary features (Graham et al., 2020). The essential components required for MC-CBT to effectively address anxiety include an activity schedule, mood tracker, relaxation techniques, and journaling (Cully et al,. 2012). The activity plan is comprised of a sequence of activities that are specifically designed to systematically decrease the user's anxiety over time (Jongsma et al., 2000). The mood tracker aids users in identifying their emotional states, promoting a greater sense of self-awareness. The journaling component of MB-CBT allows users to articulate and contemplate their emotions via interactive prompts inside the application. The relaxation approach includes multimedia content, such as videos and audios, that offer assistance on various relaxation strategies. The supplementary functionalities encompass a 'contact a psychologist' tool, which allows users to retrieve a roster of psychologists affiliated with the MB-CBT. This feature enables users to reach out to these psychologists in the event of an emergency.

The given input involves incorporating community cloud capabilities into the existing support system to facilitate the seamless discovery of social support among application users. The additional input includes including article features related with Balinese culture as supplementary tools to facilitate the dissemination of educational content on anxiety (Hilty et al., 2020). It also enables the presentation of various types of information, allowing users to acquire information not only in written form but also through visual media such as images or videos (Kolluri et al., 2022). The anxiety test, with its early detection capabilities, is a feature that participants find interesting since it helps people screen for their condition.

The initial finding pertained to the characteristics and elements that must be taken into account while creating applications for individuals who encounter anxiety. Our investigation revealed that numerous mental health applications incorporate elements such as mood tracking, activity goal setting, and relaxation exercises (Graham et al., 2020; Kolluri et al., 2022). Nevertheless, the requirements of features for users with anxiety vary from the corresponding features seen in the observed health apps. The mood tracker is crucial for accurately assessing the user's state and aids mental health practitioners in delivering more exact symptom management. Our research also shown that users prefer concise language in the design. This aligns with the discovery made by Fanfarelli et al., (2018), Wang et al (2018) which suggests that shorter sentences are effective in emphasizing instructions. Furthermore, the interview findings indicate that the creation of this prototype necessitates the incorporation of health facilities in order to establish a digital ecosystem capable of linking with the necessary mental health professionals. Furthermore, a forthcoming obstacle is the necessity of creating mental health applications that possess robust security measures, particularly in regards to managing patients' data privacy (Wang et al., 2018). These apps should also be designed to be straightforward and user-friendly, in order to further promote their use. This discovery is consistent with the findings of Graham et al., (2020) and Shania et al., (2023).

The efficacy trial of M-CBT shown that the therapy and intervention model, MB-CBT, has a significant effect in lowering stress and anxiety among participants. The community's acceptance of MB-CBT and its suitability for broader implementation align with the participants' feedback. This finding aligns with prior research (Graham et al., 2020; Hilty et al., 2020) which demonstrated that utilizing mobile-based brief cognitive behavioral therapy (CBT) is a potential method for addressing the psychological components of chronic mental health conditions. MB-CBT can be just as effective as in-person CBT in treating mental disorders (Arjadi et al., 2018).

Limitations

This study exclusively examined the backdrop of rural areas in Indonesia due to the varying health management rules in other countries. This approach can serve as a benchmark for many country contexts, provided that they possess comparable mental health interventions for young adults. Furthermore, a constraint of this study is the inclusion of exclusively young adult individuals residing in rural areas with the educational level above senior high school.

Educational gaps could lead to difficulties in understanding the content, instructions, and concepts presented in mobile apps. Therefore, this mobile apps developed with the simplicity, easy-to-navigate interfaces, minimal text and using visual aids, icons, and audio prompts with simple and clean instructions (American Telemedicine Association, 2017). Since literacy levels may vary, video messages with voice guidance already integrated into apps to help users who may struggle with reading. Video tutorials and interactive guides could help explain the steps required for using the app (Kolluri et al., 2022). The applications were also created with cultural sensitivity in mind. The applications were integrating with the local Balinese icon *canang* and frangipani flower context in the materials to enhance the familiarity with the content. This would increase the engagement and trust in the applications (Hilty et al., 2020). Hence, this research yielded a high-fidelity prototype and requires additional development.

Conclusion

This study was conducted to develop a Mindfulness-Based Cognitive Behavioral Therapy (MB-CBT) program specifically aimed at addressing anxiety among young adults living in rural parts of Bali. The findings of this study can serve as a basis for the development of targeted Mindfulness-Based Cognitive Behavioral Therapy (MB-CBT) interventions for the treatment and management of anxiety in young people in the future. Additional study should focus on developing and assessing MB-CBT that can be seamlessly incorporated into other systems. This will enable applications to support a wider array of MB-CBT service requirements, beyond just anxiety. The joint efforts between an Indonesian government and the rural population of Indonesia have the ability to effectively address the issues of anxiety and limited access to mental health care in rural areas.

Competing Interests

No competing interests need to be declared.

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