

SabaiJai: A Buddhist AI Chatbot Innovation for Stress Resilience in Thailand's Working-Aged Population

Nadnapang Phophichit ^{a,*}, Phuen Kittisobhano ^b, Weerasak Abhinandavedi ^a,
Nuntawit Dhirabhaddo ^c and Nopadol Penprachoom ^d

^a International Buddhist Studies College, Mahachulalongkornrajavidyalaya University, Thailand

^b Faculty of Humanities, Mahachulalongkornrajavidyalaya University, Thailand

^c Buddhist Research Institute, Mahachulalongkornrajavidyalaya University, Thailand

^d Information Technology Division, Mahachulalongkornrajavidyalaya University, Thailand

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Abstract

Stress resilience is a critical concern for working-aged individuals in Thailand. This study introduces SabaiJai, an AI-powered chatbot designed to enhance stress resilience by integrating Buddhist principles with modern psychological techniques. Delivered via the LINE messaging platform, SabaiJai provides psychoeducation, a 10-day structured intervention program, and an AI-driven free chat feature powered by GPT-4o. The study employed a mixed-methods approach, including a literature review, expert interviews with mental health professionals (n=4) and Buddhist scholars (n=8), and an assessment of potential user needs (n=100). Key features developed for the chatbot include a stress screening test (ST-5) and personalized user interactions. A distinctive aspect of SabaiJai is its integration of Buddhist principles with modern psychological approaches. The chatbot's content is grounded in Edith Grotberg's resilience model, emphasizing three key components: "I Have" (external resources such as social support and relationships), "I Am" (inner qualities such as self-esteem and personal resilience), and "I Can" (a person's internal abilities to cope with challenges). Additionally, SabaiJai incorporates the Five Spiritual Powers (pañcabala) from Buddhist teachings—faith (saddhā), effort (virīya), mindfulness (sati), concentration (samādhi), and wisdom (paññā)—to foster stress resilience. Preliminary user feedback demonstrates strong interest and engagement, indicating SabaiJai's potential as a culturally sensitive intervention for enhancing stress resilience. Future research should focus on large-scale efficacy testing and further refinement of the system.

Keywords

Stress Resilience, Buddhist Psychology, Buddhist Innovation, AI Chatbot, Working-aged People

Introduction

In the rapidly evolving landscape of modern society, stress has emerged as a pervasive challenge, particularly affecting the working-aged population. Thailand, like many other countries, faces significant challenges related to stress management and mental health. In Thai working adults, psychological distress is associated with job insecurity, inadequate coping with job demands, and low support by employers (Yiengprugsawan et al., 2015). This situation calls for innovative, accessible solutions to enhance stress resilience and promote mental well-being, as well as the recognition that there is value in culturally adapted mental health interventions (Rathod et al., 2018).

In recent years, the intersection of technology and mental health has opened new avenues for intervention and support. Chatbots, powered by artificial intelligence, have shown promise in providing personalized, on-demand mental health assistance (Omarov et al., 2022). These digital tools offer a unique opportunity to bridge the gap between the need for mental health support and the limited availability of human professionals, especially in high-stress environments. Chatbots can offer immediate, 24/7 support, making them a valuable resource in mental health care. As a response to the increasing demand for such applications, in recent years, several mental health chatbots have emerged in Thailand (most notably, Psyjai developed by Siriraj Hospital and Pakjai developed by Bangkok Naval Hospital). Despite this, there is little research on mental health chatbots adapted to a specific population.

Thailand's rich Buddhist heritage provides a unique cultural context and opportunity for addressing stress-related issues. Buddhist principles and the Buddha's teaching, deeply ingrained in Thai society, offer valuable insights into stress management and resilience building. By integrating these principles with modern psychological approaches and leveraging cutting-edge technology, there is potential to create a highly appealing and culturally resonant tool for building stress resilience. The combination of the Buddha's teaching and modern technology can provide a holistic approach to stress resilience.

Objectives of the Study

The primary goal of this study is to develop and introduce SabaiJai, an AI-powered chatbot system designed to enhance stress resilience among working-aged Thai individuals. This includes the following objectives:

1. Design and implement a chatbot that integrates Buddhist teachings with modern psychological stress management techniques.

2. Incorporate feedback and advice from mental health professionals and Buddhist scholars into the chatbot's development.
3. Develop a user-friendly interface for SabaiJai, accessible through the LINE messaging application.
4. Create a comprehensive 10-day stress resilience intervention program, including psychoeducation, daily exercises, and interactive real-time chat features.
5. Integrate state-of-the-art AI technology (GPT-4o) to enable free-form, personalized conversations on stress management and resilience.
6. Identify and incorporate the most requested features from potential users to ensure the chatbot meets user needs.
7. Evaluate the preliminary user feedback to refine SabaiJai and prepare it for future large-scale efficacy testing.

Significance of the Study

This study contributes to the field of digital mental health interventions, particularly within the Thai context. By developing SabaiJai, we aim to provide an accessible tool for enhancing stress resilience among working-aged Thai individuals. The chatbot integrates Buddhist teachings with modern psychological techniques, offering a culturally relevant approach to stress management. Additionally, the study explores the possibility of leveraging an AI-powered chatbot in delivering mental health support, while also providing insights into the development process and potential of such tools. We believe this study can inform future research on culturally adapted digital interventions and contribute to the broader understanding of integrating Buddhist principles with modern technology in mental health care.

Literature Review

Integrating Stress Resilience, Technology, and Buddhist Psychology

Stress resilience has become a critical focus within psychological research, particularly as modern societies grapple with increasing workplace demands and mental health challenges. Stress, defined as exposure to stimuli appraised as harmful, threatening, or challenging beyond one's coping capacity (Lazarus & Folkman, 1984), has been linked to numerous health problems, including cardiovascular diseases and mental disorders (McEwen, 2008). Conversely, stress resilience—the ability to adapt positively to adversity—is a dynamic process that can be cultivated through targeted interventions (Bonanno, 2004; Luthar et al., 2000). Interventions designed to enhance

resilience have shown promising results in reducing stress-related pathology and improving overall well-being (Joyce et al., 2018).

While traditional psychological interventions have contributed significantly to resilience-building, the advent of technology has introduced new possibilities for mental health support. Chatbots, in particular, have emerged as tools with potential to deliver accessible, scalable, and personalized mental health interventions (Omarov et al., 2022). The integration of such digital tools into mental health care not only bridges gaps in professional availability but also offers innovative, user-friendly approaches to stress management. SabaiJai aims to build on this foundation by leveraging AI to deliver culturally adapted interventions that integrate principles of Buddhist psychology, providing both structure (predefined content) and flexibility (AI-powered free chat) to promote stress resilience among Thailand's working-aged population.

AI-Powered Chatbots in Mental Health Interventions

Chatbots have rapidly gained traction as digital mental health tools, offering psychoeducation, self-help techniques, and real-time support. Woebot, a chatbot delivering cognitive-behavioral therapy (CBT), has shown significant reductions in anxiety and depression symptoms among young adults (Fitzpatrick et al., 2017). Inspired by Woebot's success, SabaiJai incorporates similarly structured psychoeducational content, adapting it to the Thai cultural context through Buddhist teachings. Similarly, Tess demonstrated efficacy in alleviating depression and anxiety among college students (Fulmer et al., 2018), highlighting the potential for chatbots to provide accessible, stigma-free support—an inspiration we adopted in SabaiJai's design to address the mental health stigma prevalent in Thai society.

Atena, a psychoeducational chatbot, effectively reduced stress and anxiety in university students during the COVID-19 pandemic (Gabrielli et al., 2021). This study emphasized the value of brief, engaging content, informing our decision to develop concise video modules for SabaiJai's 10-day intervention program. Similarly, Popbots, designed for working-aged individuals, showed promising results in managing daily stressors and reducing depression symptoms (Mauriello et al., 2021).

Vitalk, an interactive chatbot, improved resilience and mental well-being among health workers in Malawi during the COVID-19 pandemic (Kleinau et al., 2024), and filled a gap by providing a service not readily available in Malawi. Vitalk's success inspired SabaiJai's focus on the working-aged population, as well as our goal to benefit groups underserved by mental health services, such as people living in rural Thailand. These studies collectively underscored the potential of chatbots to support stress resilience

across diverse demographics and cultural contexts. Additionally, evidence suggests that using a mental health app for as little as 10 days can yield beneficial effects (Economides et al., 2018), informing SabaiJai's content design to include a 10-day intervention.

Despite their growing popularity, most mental health chatbots have been developed in Western contexts, limiting their cultural applicability in non-Western societies. In Thailand, notable examples such as PsyJai (developed by Siriraj Hospital) and PakJai (developed by Bangkok Naval Hospital) have emerged. However, these chatbots do not fully incorporate culturally significant frameworks, such as Buddhist psychology, which is crucial since different target groups often require customized features from a chatbot interface (Bendig et al., 2019). Addressing this gap, SabaiJai was developed to integrate Buddhist principles into its intervention model, offering a culturally appropriate tool designed to enhance stress resilience and mental well-being in Thailand's working-aged population.

Buddhist Psychology as a Framework for Stress Resilience

Buddhist psychology provides a comprehensive framework for understanding and managing stress, emphasizing the Five Spiritual Powers (pañcabala) as key to cultivating mental resilience. Its positive approach to mental health has been increasingly recognized in psychological literature (Wallace & Shapiro, 2006). Previous research has demonstrated a significant positive correlation between the Five Spiritual Powers—faith (saddhā), effort (virīya), mindfulness (sati), concentration (samādhi), and wisdom (paññā)—and resilience levels (Phophichit, 2017). Substantial evidence supports the role of these components in enhancing resilience and managing stress. Each of the Five Spiritual Powers contributes to stress management and resilience-building in distinct yet interconnected ways.

For instance, Faith (saddhā) – Confidence and Emotional Stability refers to trust in the Dhamma, in one's practice, and in the potential for inner transformation. It reduces stress by fostering hope and emotional security, minimizing anxiety and self-doubt when facing challenges. Faith encourages a positive outlook and strengthens one's ability to persevere in difficult situations. Studies have shown that religious belief (saddhā) positively impacts coping mechanisms, particularly in response to crises such as COVID-19-related stress (Petrov et al., 2021). Effort (virīya) – Motivation and Perseverance represents persistent effort and determination when encountering difficulties. It supports stress management by encouraging proactive coping strategies, ensuring that individuals continue practicing mindfulness, meditation, or problem-solving rather than remaining

passive or succumbing to despair. Research has demonstrated that effort (*virīya*) has a significant impact on resilience, accounting for 43.60% of the variance, with statistical significance at $p < .001$, highlighting its crucial role in fostering resilience (Phophichit, 2019).

Mindfulness (*sati*) – Awareness and Presence in the Moment is a core mechanism for stress reduction, allowing individuals to recognize stress triggers without reacting impulsively. By maintaining awareness of thoughts, emotions, and bodily sensations, mindfulness interrupts automatic stress responses, fostering clarity and composure. While mindfulness is central to Buddhist teachings, it has also been widely adopted in Western psychological interventions such as Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 2003). However, Buddhist psychology extends beyond mindfulness alone, incorporating a broader set of principles that contribute to resilience-building. Studies indicate that mindfulness (*sati*) significantly enhances resilience, explaining 41.20% of the variance, with the same high level of statistical significance ($p < .001$) (Phophichit, 2019). Moreover, mindfulness-based interventions (MBIs) have been extensively studied for their effectiveness in reducing stress, anxiety, and depression (Khouri et al., 2013).

Concentration (*saṃādhi*) – Mental Stability and Focus allows individuals to remain centered and focused, preventing emotional distress. Deep meditative absorption (*saṃādhi*) is linked to reduced anxiety and fosters lasting transformations in attention, emotional regulation, and cognitive flexibility (Yamashiro et al., 2015). Developing focused attention helps individuals disengage from stress-inducing distractions and negative thought patterns, promoting inner calm and psychological stability.

Wisdom (*paññā*) – Insight and Understanding of Reality enables individuals to perceive stress and impermanence with clarity, reducing attachment to distressing emotions. It encourages cognitive reappraisal, allowing individuals to see stress as a learning experience rather than a threat. By realizing the Three Characteristics (*tilakkhaṇa*)—that stress or stressors are impermanent (*anicca*), inherently unsatisfactory (*dukkha*), and beyond one's control (*anattā*)—one develops a deeper sense of acceptance and resilience. This wisdom forms the foundation for stress resilience and the alleviation of suffering. Previous research has shown that wisdom and knowledge play a significant role in enhancing resilience for individuals experiencing stress (Yuliasih & Akmal, 2017). Additionally, resilience, mastery, and perceived stress fully mediated the positive association between wisdom and subjective well-being in adults, highlighting the critical role wisdom plays in well-being and stress management (Ardelt & Dilip, 2022).

Through this realization, individuals enhance their capacity to navigate life's fluctuations with clarity, ultimately fostering greater psychological flexibility and well-being.

The findings collectively highlight the importance of the Five Spiritual Powers in enhancing stress resilience. Each power fosters cognitive, emotional, and behavioral tools essential for coping with stress and building resilience. Faith instills confidence in overcoming challenges, while energy drives consistent effort in applying stress management techniques. Mindfulness and concentration cultivate awareness and mental clarity, and wisdom provides insight into the nature of stress and its triggers. The SabaiJai intervention program is structured around these five powers, offering users a comprehensive, culturally grounded framework for stress resilience. Additionally, Buddhist teachings on compassion and equanimity contribute to resilience by promoting balanced emotional responses and reducing interpersonal stress (Gilbert, 2010). By incorporating these teachings into SabaiJai's content, the program aligns with contemporary research that highlights the effectiveness of compassion-focused interventions in enhancing mental well-being (Van Gordon et al., 2015). Furthermore, the synergy between Buddhist concepts and contemporary resilience theories underscores the potential of Buddhist psychology as a culturally resonant framework for stress management (Christopher & Maris, 2010).

Towards a Culturally Adapted Intervention: SabaiJai

The intersection of AI, technology, modern psychological techniques, and Buddhist principles offers a unique avenue to develop culturally adapted mental health interventions. SabaiJai, an AI-powered chatbot, aims to fill this gap by integrating Buddhist psychology with evidence-based stress resilience strategies tailored to Thai working-aged individuals. By leveraging the Five Spiritual Powers and incorporating feedback from mental health professionals and Buddhist scholars, SabaiJai seeks to provide a holistic, culturally relevant tool for enhancing stress resilience. Existing research highlights the effectiveness of both chatbots and Buddhist psychological principles in promoting mental health. However, few studies have explored their integration into a comprehensive digital intervention. SabaiJai addresses this gap by combining structured psychoeducational content, daily interventions, and AI-powered free-form conversations, creating a multifaceted, culturally adapted and stigma-free approach to mental health support through enhancing stress resilience. The chatbot's design reflects the cultural values and spiritual traditions of Thai society, enhancing its relevance and potential impact.

Gaps in Existing Research

Despite the growing body of research on mental health chatbots and the recognized value of Buddhist principles in enhancing stress resilience, several gaps remain in the literature:

Limited culturally adapted chatbots: Most mental health chatbots have been developed and tested in Western contexts, with limited research on their effectiveness in non-Western cultures, particularly in Southeast Asian countries like Thailand. Unique sociocultural factors, such as face culture—the emphasis on maintaining one's social reputation and avoiding shame—and the stigma surrounding mental health in Asia, complicate the deployment of AI-based mental health interventions in these regions, which underscores the need for culturally adapted mental health interventions in Southeast Asia, to effectively address local mental health challenges (Day, 2023).

Integration of Buddhist principles: While numerous psychological interventions for stress resilience exist, many rely on Western frameworks like Cognitive Behavioral Therapy (CBT) and Mindfulness-Based Stress Reduction (MBSR), which lack cultural adaptation for societies where religion plays a key role. Existing mental health chatbots in Thailand, such as Psyjai and Pakjai, also do not integrate Buddhist principles, limiting their cultural relevance and appeal. Therefore, there is a lack of research on comprehensive chatbot systems that fully integrate Buddhist psychological principles. Moreover, to our knowledge, no chatbots developed so far have integrated the principles of Buddhist Psychology and the Buddha's teaching.

Focus on the working-aged population: Many studies on mental health chatbots have focused on younger populations, such as college students (Mahmud & Porntrakoon, 2023). There is a need for more research on interventions tailored specifically for working-aged individuals facing occupational stress (Carolan et al., 2017). This group is ideal for chatbot-based interventions since moderate work-related stress is less risky and less ethically sensitive to address with a chatbot-based support tool, unlike broader mental health issues, which often require human professionals.

Combination of fixed content and AI-driven interactions: While some chatbots offer predefined content and others use AI for free-form conversations, there is limited research on systems that effectively combine both approaches. Incorporating AI into a mental-health chatbot carries unique ethical issues, and there is a growing need for research into their benefits and risks (Coghlan et al., 2023).

This study aims to address these gaps by developing and evaluating SabaiJai, a culturally adapted chatbot that integrates Buddhist principles with modern stress resilience techniques, targets working-aged Thai individuals, and combines structured interventions with AI-driven free-form interactions.

Materials and Methods

Research Design

This study employed a mixed-methods approach to develop and preliminarily test the SabaiJai system. The research design consisted of several phases, including a literature review and conceptual framework development, qualitative data collection through expert interviews and potential user assessments, chatbot development and iterative refinement, and preliminary testing and feedback collection. This approach allowed for a comprehensive understanding of the theoretical foundations, user needs, and technical requirements for developing an effective stress resilience chatbot tailored to the Thai cultural context.

Participants and Sampling

The study involved several groups of participants. Mental health experts ($n=4$) were selected using purposive sampling based on their expertise in relevant fields. This group included two psychologists specializing in high-stress environments (police psychologists), one private psychologist counseling stress-related issues, and one forensic psychologist. Buddhist scholars ($n=8$) were also chosen through purposive sampling due to their specialization in Buddhist psychology and stress management through meditation. Potential users ($n=100$) were recruited using purposive sampling, targeting working-aged Thai individuals who expressed interest in using a stress management and resilience-building chatbot. The inclusion criteria required participants to be within the working-age range (aged 20–70) and interested in using a Buddhist AI chatbot innovation tool to enhance stress resilience.

Instruments and Measures

Stress Test Questionnaire (ST-5)

The Stress Test Questionnaire (ST-5) was developed by the Department of Mental Health, Ministry of Public Health (Thailand), and was utilized to measure stress levels among participants (Silpakit et al., 2010). The internal consistency of the ST-5 was measured using Cronbach's Alpha Coefficient, achieving a coefficient of 0.700, indicating that the questionnaire is reliable. The ST-5 consists of five items, each assessing symptoms or feelings experienced over the past 2-4 weeks. The items are rated on a scale from 0 to 3, with 0 indicating "very rare or almost never," 1 indicating "occasionally," 2 indicating "frequently," and 3 indicating "regularly." Items include having sleep problems (difficulty falling asleep or excessive sleep), decreased concentration, irritability

or restlessness, feeling bored or frustrated, and avoiding social interactions. The total score is interpreted as follows: 0-4 indicates mild stress, 5-7 indicates moderate stress, 8-9 indicates high stress, and 10-15 indicates very high stress. The implementation of the ST-5 in this research involved integrating the questionnaire into the SabaiJai on the LINE application, and is intended as a screening tool for potential users of SabaiJai. Individuals scoring very low on the ST-5 would likely derive little benefit from using the chatbot, while SabaiJai refers potential users with very high stress levels to human mental health experts. In contrast, users with mild/moderate stress were encouraged to keep using SabaiJai.

Resilience Quotient Test

The Resilience Quotient (RQ) questionnaire is a validated instrument designed to measure individual resilience levels, focusing on the ability to adapt to and recover from stress and adversity, and is widely used for research purposes in Thailand (Sanphiboon et al., 2024; Seehamongkon et al., 2023; Weraarchakul et al., 2016). Developed specifically for the Thai population aged 25-60 years, the test was based on a sample of 4,000 individuals from 12 provinces in Thailand in 2008. The RQ demonstrates robust psychometric properties, with a Cronbach's Alpha Coefficient of 0.749. Comprising 20 items, the RQ questionnaire assesses three dimensions of resilience: Personal Competence (items 1-10), Trust / Tolerance / Strengthening Effects of Stress (items 11-15), and Social Competence (items 16-20). Respondents rate each item on a 4-point Likert scale ranging from "Not true" to "Very true." The scoring system categorizes results for each dimension and overall resilience as below average, average, or above average. For Personal Competence, scores below 27 are considered below average, 27-34 average, and above 34 above average. Trust/Tolerance/Strengthening Effects of Stress scores are interpreted as below average (<14), average (14-19), and above average (>19). Social Competence scores are classified as below average (<13), average (13-18), and above average (>18). The overall resilience score is categorized as below average (<55), average (55-69), and above average (>69). Gender-based analysis of RQ scores revealed no significant overall differences between males and females, though females tended to score higher in emotional stability. The test has demonstrated a strong correlation with mental health outcomes, with 92% of high-scoring individuals reporting good mental health, compared to only 7% of those with low RQ scores. The Resilience Quotient (RQ) test proves particularly suitable for assessing stress resilience in the Thai context. Its three-dimensional structure directly addresses key components of stress resilience, with the Trust/Tolerance/Strengthening Effects of Stress dimension

specifically evaluating capacity to withstand and grow from stressful experiences. Developed using a large Thai sample, the RQ ensures cultural relevance, capturing nuances of stress and coping mechanisms specific to Thai society. The strong correlation between high RQ scores and good mental health (92% concordance) further validates its effectiveness in identifying stress-resilient individuals. These features, combined with its robust psychometric properties, establish the RQ as an appropriate and valuable tool for assessing stress resilience in Thai populations. In the context of this research, the RQ was integrated into the SabaiJai application to measure changes in perceived resilience before and after using the app, providing valuable insights into the intervention's effectiveness in enhancing users' resilience levels.

In summary, the Resilience Quotient (RQ) is a validated tool measuring stress resilience across three dimensions: Personal Competence, Trust/Tolerance/Strengthening Effects of Stress, and Social Competence. Developed for the Thai population, it demonstrates strong reliability and a clear link between high scores and good mental health, therefore it was integrated into SabaiJai.

Qualitative Interviews with Experts and Potential Users

Semi-structured interviews were conducted in person with mental health experts, Buddhist scholars, and potential users. These interviews focused on ethical considerations in chatbot development, appropriate content and intervention strategies, integration of Buddhist principles in enhancing stress resilience, user experience and interface design preferences, and potential limitations and areas for improvement. Interviews were recorded and analyzed using thematic analysis to identify key insights and recommendations. Data collection from potential users were conducted via Google forms, where potential users answered questions about their experience with chatbot systems, work-related stress and requested features for SabaiJai.

Chatbot Development

The development of SabaiJai followed an iterative process. First, conceptualization was based on a literature review and expert input, which led to the development of a conceptual framework integrating Buddhist principles and modern stress resilience techniques. Next, educational content, including psychoeducation videos and stress resilience intervention materials, was created based on the qualitative interviews conducted with mental health experts and Buddhist scholars. The chatbot was then developed using the LINE Messaging API (Application Programming Interface) for user interaction and integrated with OpenAI's GPT-4o model for the free chat feature. The system was deployed on Heroku for scalability and reliability. An intuitive interface

was designed within the LINE application, featuring easy-to-use menus and clear navigation options. Various features were implemented, including user registration, stress screening (ST-5), psychoeducation videos, 10-day stress resilience intervention program, and the Resilience Quotient test. Finally, free chat interaction with the GPT-4o model was integrated into the system, with a custom system prompt to ensure responses aligned with Buddhist principles and stress management best practices.

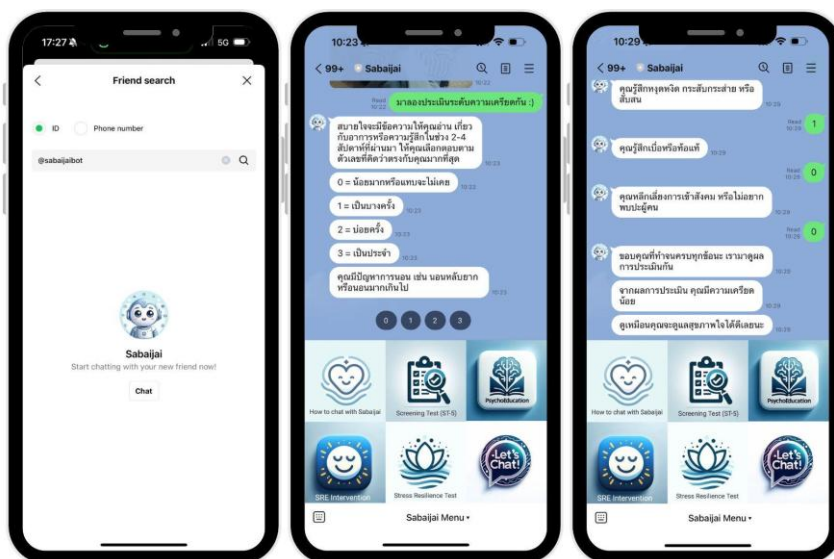


Figure 1 Landing screen and user interface of SabaiJai

Source: Screenshot by the author

The development of SabaiJai involved a multifaceted approach, integrating psychological principles, Buddhist teachings, and advanced technology to create a comprehensive stress resilience tool tailored for the Thai population. This section details the design, features, content development, and technical implementation of the chatbot.

Design and Features of SabaiJai

SabaiJai was conceptualized as an all-encompassing stress resilience-enhancing assistant, accessible through the LINE messaging application, a platform widely used in Thailand. The choice of LINE as the delivery medium was strategic, aiming to leverage familiarity and ease of access for Thai users. To develop a functional and intuitive user interface (UI) and user experience (UX), the first phase of UI/UX testing was conducted by the developer to ensure technical functionality and flow within the LINE messaging app. This was followed by a second round of testing conducted by the research team, focusing on user experience. The chatbot's core functions include user

registration, stress screening, psychoeducation, a structured stress resilience intervention program, resilience assessment, and a free-chat feature for open-ended stress-related discussions. The user journey begins with registration, where demographic information and preferences are collected to personalize the experience. Following registration, users can access various features through a menu-based interface. The ST-5 questionnaire is employed for initial stress screening, determining user eligibility for the full intervention program.

Content and Educational Material

Central to SabaiJai's effectiveness is its rich educational content. The psychoeducation component comprises a series of concise video clips, typically under one minute in duration, covering fundamental aspects of stress. These clips elucidate the nature of stress, its physiological and psychological effects, common workplace stressors, and the relationship between stress and performance. The brevity and visual appeal of these clips were designed to maintain user engagement and facilitate easy absorption of information. The psychoeducation component was structured to provide a comprehensive understanding of stress and resilience. It begins with an introduction to what stress is, followed by an exploration of the causes of stress and the different types of stress. A dedicated section examines stress from a Buddhist perspective, offering insights into how Buddhist teachings interpret and address stress. The program then covers the effects of stress on both physical and mental health, emphasizing the importance of basic stress awareness in daily life. To equip individuals with practical strategies, the curriculum includes SabaiJai Techniques, which focus on returning to the present moment, alongside Buddhist principles for building stress resilience. Additionally, mindfulness practices are introduced to further enhance resilience. Finally, the program incorporates stories and fables for stress resilience, encouraging a shift in perspective and a more adaptive attitude toward stressors.

The cornerstone of the intervention is a 10-day program featuring daily video content, each 1-5 minutes long. This program progressively guides users through understanding stress from a Buddhist perspective, recognizing stress symptoms, applying Buddhist psychology to enhance stress resilience, practicing mindfulness and cognitive restructuring, building emotional resilience through compassion, and integrating stress management techniques into daily life. Some videos are accompanied by reflective exercises or practical tasks, reinforcing learning and encouraging real-world application. The intervention content is designed to enhance stress resilience through a structured framework. It begins with an introduction to stress resilience, setting the

foundation for understanding its key components. The program then explores the I Have aspect, which focuses on external support systems, followed by I Am, which emphasizes inner strengths, and I Can, which develops problem-solving skills. Building on these resilience factors, the content integrates core Buddhist principles, including faith (saddhā), effort (viriya), mindfulness (sati), concentration (samādhi), and wisdom (paññā)—collectively known as the Five Spiritual Powers (pañcabala). Finally, the program introduces the concept of The Three Common Characteristics (tilakkhaṇa), with a particular focus on the idea that “This Too Shall Pass,” reinforcing the impermanent nature of stress and fostering a balanced perspective on life’s challenges. This structured approach combines cognitive, emotional, and spiritual strategies to foster resilience, helping users manage stress in a culturally resonant and practical manner.

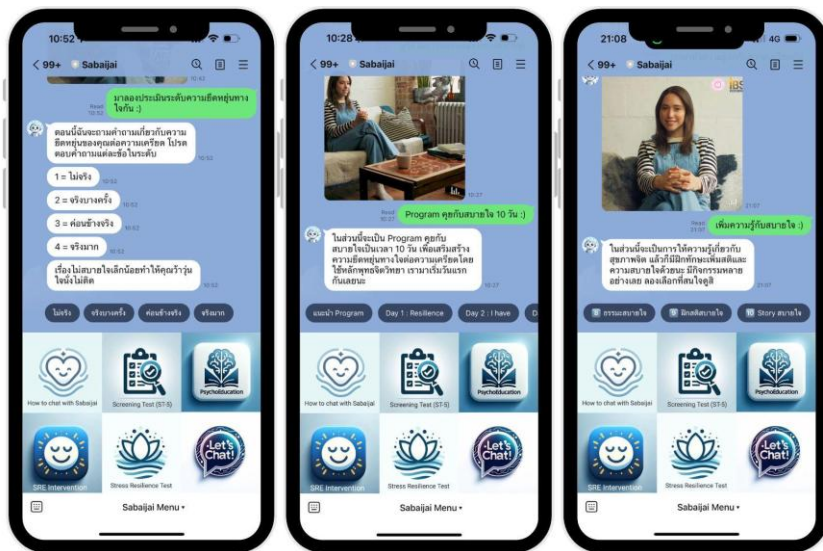


Figure 2 SabaiJai Menu, Psychoeducation, and 10-day intervention program

Source: Screenshot by the author

Incorporation of Buddhist Principles

A distinctive feature of SabaiJai is its integration of Buddhist principles with modern psychological approaches. The chatbot’s content is grounded in Edith Grotberg’s resilience model, which emphasizes three key concepts: “I Have,” referring to external resources and social support available to an individual, such as relationships, skills, and material resources that can strengthen resilience; “I Am,” which highlights inner qualities like self-esteem and personal resilience; and “I Can,” focusing on a person’s internal

abilities and emphasizing confidence in one's capacity to cope with and act effectively in challenging situations.

These three components are seamlessly woven together with Buddhist principles of the Five Spiritual Powers (pañcabala)—faith/conviction (saddhā), energy/effort (virīya), mindfulness (sati), concentration (samādhi), and wisdom/discernment (paññā)—which form the structural backbone of the chatbot's content and interactions. Through this integration, SabaiJai offers a unique, culturally grounded approach to enhancing stress resilience. Each of the Five Spiritual Powers is thoughtfully incorporated into the intervention program, creating a cohesive framework that supports individuals. By combining the Buddha's teachings with contemporary psychological theory, SabaiJai aims to improve users' stress resilience and overall mental well-being.

Technical Implementation

The technical architecture of SabaiJai was built on a Node.js backend with an Express web server, chosen for its efficiency in handling asynchronous operations and its robust ecosystem. This setup facilitates rapid response times and efficient management of concurrent user interactions. Integration with the LINE Messaging API was crucial for enabling rich user interactions. The API allows for the implementation of various message types, including text, images, videos, and interactive elements like buttons. A webhook endpoint was established to receive and process user messages and events, ensuring real-time responsiveness. The free-chat feature leverages OpenAI's GPT-4o model, integrated via the OpenAI API. Custom prompt engineering was employed to guide the model's responses, ensuring alignment with Buddhist principles and maintaining conversation coherence. Data management and privacy were prioritized in the development process, and SabaiJai keeps no record of any conversations with users. The user interface was crafted with simplicity and cultural appropriateness at its core. The design emphasizes clear navigation, concise instructions, and the use of multimedia elements to enhance engagement. The SabaiJai avatar image was created to be culturally appealing to Thai users, and to reflect a friendly and helpful attitude. Default communication of SabaiJai is in Thai. Rigorous testing was integral to the development process. This included unit testing of individual components, integration testing of API interactions, and testing by and demonstrating to some of the Buddhist scholars and mental health interviewees in order to collect continuous feedback. This feedback gathered from preliminary testing was systematically incorporated into iterative improvements of the system.

The development of SabaiJai represents a synthesis of cultural sensitivity, psychological insight, and technological innovation. By integrating Buddhist principles with contemporary stress management techniques and leveraging advanced AI capabilities, SabaiJai offers a unique, culturally attuned approach to fostering stress resilience among Thai users. The next phase of research will focus on evaluating its effectiveness and impact through comprehensive user testing.

Results

Key Insights from Potential User Assessments

The majority of respondents had experienced work-related stress, with the most common response being that they experienced stress “sometimes.” A majority had not used chatbots before for stress management, however 31% of participants reported having used general AI models like ChatGPT and Google Gemini to reduce stress. A large majority expressed interest in trying SabaiJai and were interested in joining the next phase of the research project.

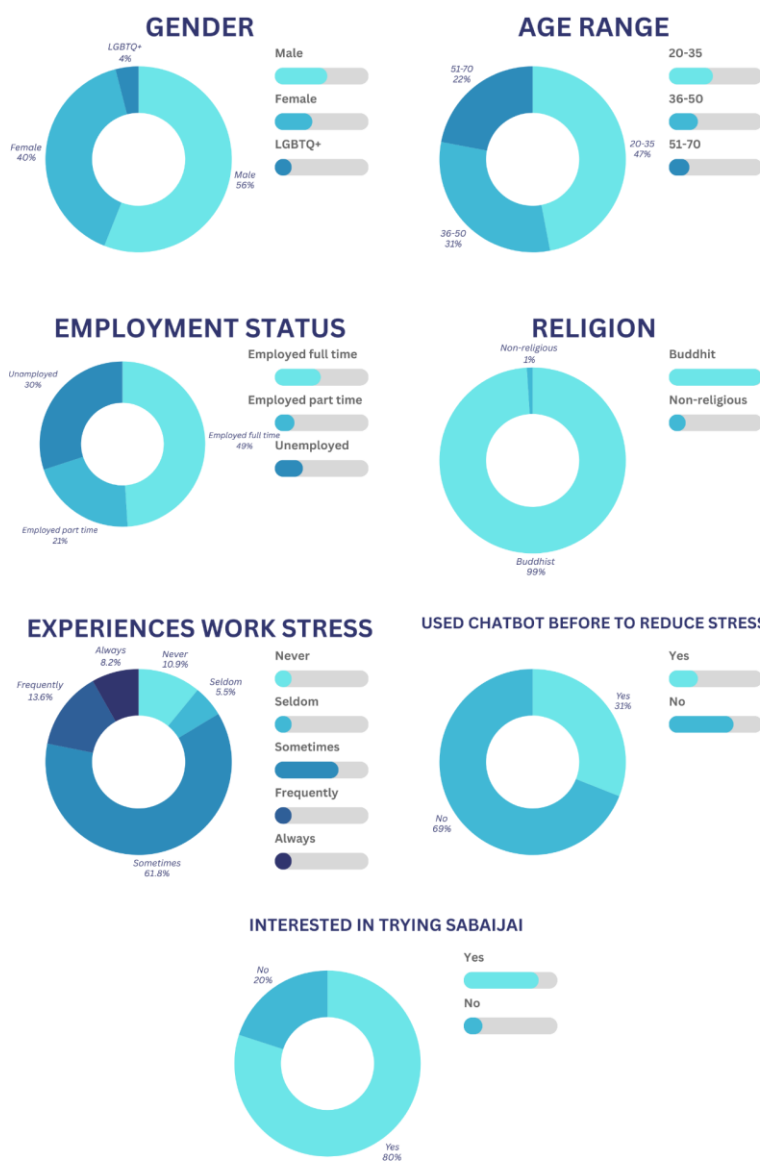


Figure 3 Demographic information of potential users (n = 100)

Source: Graph by the author

Potential users expressed a diverse range of desired features and concerns. Key requests included ease of use, culturally relevant content incorporating Buddhist principles, personalization, and reliable, evidence-based information. Many users desired a free-form question-answering capability for stress-related queries, with one suggesting the experience should be like "having a Dhamma conversation with Siri." Specific feature

requests included meditation guidance, stress level tracking, short video interventions, and positive affirmations. Users emphasized the importance of privacy and data security.

Additional user feedback highlighted desires for a polite interface, interactive features like chat discussions and group activities for idea exchange, and multimedia content including pictures and videos. Some users expressed interest in breathing exercises and kind, supportive dialogue to help reduce stress. Practical suggestions included an easy-to-navigate menu bar with options like "Take a stress test" and continuous monitoring to provide timely assistance. Many respondents emphasized that meeting their needs would directly contribute to happiness and stress reduction.

Notably, while 31% of respondents reported using general AI models like ChatGPT for stress reduction, 80% expressed interest in trying SabaiJai, indicating a strong market need for specialized, culturally-tailored digital mental health interventions that incorporate these user-requested features.

Key Insights from Interviews with Experts

Insights from the interviews with Buddhist scholars highlighted the importance of promoting the Five Spiritual Powers (pañcabala) to increase mental health and stress resilience. Each factor of these Five Spiritual Powers can contribute to stress resilience, even if not cultivated in any specific order. Moreover, they explained how the Five Spiritual Powers (pañcabala) in Buddhism offer a comprehensive framework for enhancing stress resilience. Namely, Faith (saddhā) instills confidence in one's ability to overcome challenges, providing motivation and purpose. Energy (viriya) drives consistent effort in applying stress management techniques and maintaining self-care practices. Mindfulness (sati) cultivates awareness of thoughts, feelings, and bodily sensations, enabling early recognition of stress triggers and more skillful responses. Concentration (samādhi) promotes mental clarity and emotional stability, improving decision-making under pressure. Wisdom (paññā) fosters insight into the nature of stress and one's reaction patterns, leading to a more balanced perspective on stressful situations.

Together, these five powers create a holistic approach to stress resilience, equipping individuals with cognitive, emotional, and behavioral tools to effectively manage stress, maintain balance, and adapt to challenging circumstances. Buddhist scholars also emphasized the need for users to have the freedom to choose between a male-style and female-style model and suggested that the chatbot should incorporate voice elements to convey information. Additionally, they recommended that the chatbot's responses be brief and concise. The scholars also noted that having a strong religious

background, including the Five Spiritual Powers, can help combat stressful situations. Some Buddhist scholars provided valuable insights for the chatbot's development, emphasizing the importance of integrating chat functionality, recreational games, dharma discussions, and various stress-relief methods. For the 10-day program, the scholars recommended a diverse range of content, including Buddhist chanting and dhamma stories presented in contemporary contexts. These stories aim to shift working-aged individuals' attitudes towards stressful situations and bolster their resilience. The scholars also suggested assessing stress resilience through multiple factors, such as physical behavior, conversation style, thought patterns, community involvement, and task achievement. Importantly, they emphasized that the chatbot should embody its name, "SabaiJai" (which roughly translates to "Ease of Mind" in English), by creating a genuinely relaxing and comforting experience for its users.

Psychologists provided insights on how the chatbot should aim to change users' attitudes and offer different/alternative perspectives about their situation when they feel stressed. They suggested that the chatbot should promote awareness and acceptance of stressful situations and encourage a stable social background outside of work to help cope with work-related stress. Constant appreciation of positive aspects of life was also highlighted as a way to enhance stress resilience. The mental health experts stressed the importance of the chatbot having a way to screen and filter out users for whom the system might be detrimental, and in cases of serious mental health issues, refer users to human mental health professionals. They also emphasized the importance of clear boundaries for the chatbot's role, ensuring users understand it is a supplementary tool rather than a replacement for professional help, which is in line with concerns raised by several scholars in the past about accountability, transparency and privacy (Davenport & Kalakota, 2019; Gonçalves dos Santos & Rosinhas, 2023; Kretzschmar et al., 2019).

Features of the SabaiJai System

The iterative development process of the SabaiJai prototype resulted in the creation of several key features. The chatbot includes a user registration process where users provide biographical information (e.g., age, gender, relationship status, and employment status) and can choose the chatbot's interaction style (male or female), which is especially relevant in Thai language due to the usage of gender-specific first-person personal pronouns and polite particles. To personalize user interaction, this information is made available to ChatGPT-4o in the free chat mode, with the system prompt specifically guiding GPT-4o to take this information into account when responding to user messages. The stress screening feature, using the ST-5 questionnaire, assesses

users' eligibility for using the bot. The chatbot also offers psychoeducation videos that provide information on stress and stress management, integrating Buddhist principles. A central component of the chatbot is the 10-day stress resilience intervention program, which includes daily video clips and exercises designed to build stress resilience. The Resilience Quotient Test, a 20-item test, was integrated into the system to be administered pre- and post-intervention to measure changes in stress resilience. Additionally, the chatbot features a free chat function driven by the GPT-4o model, allowing users to freely discuss stress-related issues. The development of SabaiJai was guided by expert input and potential users' suggestions, ensuring the chatbot was culturally appropriate and met the needs of working-aged Thai individuals. The integration of Buddhist principles and modern psychological techniques aimed to create a holistic tool for enhancing stress resilience. SabaiJai is currently operational and can be interacted with through the LINE messaging application by searching the "@sabaijaibot" LINE ID, but iterative refinement and safety testing of the system is needed before the system can be rolled out to a wider audience.

Discussion

The development of SabaiJai represents a novel approach to addressing stress resilience among working-aged Thai individuals, directly fulfilling our objective of designing a culturally-adapted chatbot, which integrates Buddhist principles with modern psychological interventions. This approach aligns with the increasing recognition of AI-based conversational agents as promising tools in mental health support and aligns well with the call for further research into their feasibility (Li et al., 2023). This underscores the need for more culturally adapted research in this field. Recent systematic reviews and meta-analyses have highlighted both the potential and the gaps in understanding the effectiveness of these interventions across diverse populations, calling for further exploration in non-Western contexts like Thailand. This study contributes to filling that gap by demonstrating how Buddhist psychological principles can be effectively integrated into a digital mental health intervention tailored to the Thai cultural context. This section discusses the key findings from the development phase, insights gained from expert and user interviews, and potential implications for both practice and research in the field of digital mental health.

Summary of Key Findings from the Development Phase

The iterative development process of SabaiJai yielded several significant findings. Firstly, the integration of Buddhist principles with established psychological approaches proved to be a complex but rewarding endeavor. The Five Spiritual Powers

(pañcabala) from Buddhist psychology provided a robust framework for structuring the intervention content, aligning well with contemporary stress resilience concepts. This integration reflects broader trends in utilizing Buddhist principles for mental health interventions, emphasizing how Buddhist mind-training practices can foster resilience in the face of stress and adversity (Gajaweera & DeAngelo, 2021). This integration highlighted the potential for culturally-rooted wisdom to enhance the efficacy and acceptability of mental health interventions. Secondly, the technical implementation revealed both challenges and opportunities in creating an AI-powered mental health chatbot. The use of the LINE messaging platform facilitated easy access and familiarity for Thai users, while the integration of GPT-4o for the free-chat feature demonstrated the potential for more nuanced and personalized interactions. This fulfilled our objective to include state-of-the-art AI technology in SabaiJai, and present the system through an interface which is already familiar to most people in Thailand. SabaiJai's use of the LINE platform, a ubiquitous communication tool in Thailand, mirrors strategies seen in interventions like Vitalk in Malawi, which leveraged WhatsApp to reach out to users (Kleinau et al., 2024). However, ensuring the AI's responses remained culturally appropriate and clinically sound required careful prompt engineering and ongoing refinement, particularly regarding the AI's system prompt. Thirdly, the development of concise, engaging psychoeducational content proved crucial. The creation of brief video clips and a structured 10-day program highlighted the importance of balancing information delivery with user engagement, particularly for a working-aged population with limited time resources.

Insights from Expert and User Interviews

Interviews with mental health professionals, Buddhist scholars, and potential users provided valuable insights that shaped the chatbot's development, directly supporting our objective to incorporate feedback and advice from these experts to ensure cultural and psychological relevance. Concerns raised about the chatbot's boundaries led to the consideration of implementing clear disclaimers and referral protocols within the chatbot system, while suggestions about screening and filtering out people with high level of stress led to the incorporation of the ST-5 screening test, as well as the implementation of a disclaimer message suggesting to seek professional help from human experts for people who experience a significant level of work-related stress. Buddhist scholars also contributed significantly to the authentic integration of Buddhist principles into the intervention. They highlighted the importance of presenting the Buddhist concepts in a manner that is both true to their origins and accessible to a

modern audience. This guidance influenced the language and the chatbot's content, ensuring cultural resonance while maintaining practical applicability. Suggestions from experts also led to the implementation of an option where the user can choose a preferred gender style for the free-chat feature in order to feel more comfortable when talking to SabaiJai, which aligns with findings that gender affects users' perceptions of chatbot systems due to the tendency to anthropomorphize chatbot agents (Helme-Guizon et al., 2024). Potential users expressed a strong interest in the concept of a Buddhist-inspired stress management tool, indicating a market need for culturally-tailored digital mental health interventions. Also, the majority of potential users (54.55%) reported experiencing work-related stress sometimes, which is in line with SabaiJai's aim of targeting a population of potential users who experience moderate level stress. The widespread use of general-purpose AI models like ChatGPT for stress reduction highlights the necessity of offering specialized solutions like SabaiJai. Without tailored options, users may rely on AI chatbots not designed specifically for stress management and resilience training, lacking the structured framework to ensure safety and mental well-being. The user survey results reveal both the promise and challenges inherent in deploying culturally adapted mental health chatbots like SabaiJai. While only 31% of participants had previously used general AI models, such as ChatGPT and Google Gemini, to manage stress, the fact that 80% expressed interest in SabaiJai highlights a significant unmet need for specialized, culturally resonant interventions. This interest may suggest that generic AI models may lack the nuanced cultural, religious, and psychological appeal necessary for effective stress management in specific populations. This aligns with broader literature emphasizing the need for culturally sensitive mental health solutions (Ellis et al., 2022). Furthermore, the high rate of work-related stress reported by potential users, with 68% experiencing stress "sometimes" and 24% "frequently" or "always," underscores the need for SabaiJai's targeted intervention.

Potential Implications for Practice and Research

The development of SabaiJai has several implications for both practice and research in digital mental health. For practitioners, it demonstrates the potential of integrating cultural and spiritual elements into digital interventions, potentially increasing their relevance, effectiveness and appeal for specific populations. This aligns well with findings that cultural adaptation represents a powerful opportunity to circumvent barriers to mental health treatment and improve mental health equity (Ellis et al., 2022). This approach could inspire similar culturally-tailored interventions in other contexts, promoting a more diverse and inclusive landscape of digital mental health tools. From a

research perspective, SabaiJai opens up new avenues for investigating the efficacy of AI-assisted, culturally-adapted mental health interventions. The combination of structured content delivery and AI-powered free chat provides a unique model for studying user engagement and intervention effectiveness. Also, the AI free chat feature, while it must be positioned as a complementary resource rather than a replacement for a mental health professional, still offers an element of personalization, which is a key benefit of AI powered mental health support systems (Khawaja & Bélisle-Pipon, 2023). Future studies could explore how different components of the chatbot (e.g., psychoeducation videos, daily exercises, AI interactions) contribute to outcomes, informing the design of future digital interventions. Moreover, the data generated through user interactions with SabaiJai could provide valuable insights into stress patterns, coping mechanisms, and language use related to mental health among Thai working-aged individuals. This data, analyzed with appropriate ethical considerations, could contribute to our understanding of cultural variations in stress experiences and resilience-building processes, but would require very thorough safeguards in terms of personal data protection, research ethics and privacy. The development process also highlighted areas for future research, including the optimal balance between automated responses and AI-generated content in mental health chatbots, the long-term efficacy of digital interventions for stress resilience, and the potential for AI to adapt interventions based on individual user characteristics and preferences. Future research is needed to confirm that the SabaiJai system is effective in building stress-resilience in working-aged Thai individuals.

Expected Outcomes and Benefits

The development and implementation of SabaiJai are anticipated to yield several significant outcomes. Primarily, we expect to see measurable improvements in stress resilience among working-aged Thai individuals who use the system, as indicated by enhanced scores on the Resilience Quotient test. This improvement would demonstrate the chatbot's effectiveness in equipping users with practical tools for stress management, but future research is needed to confirm these assumptions. A key benefit of SabaiJai is its potential to democratize access to mental health support. By leveraging the widely-used LINE platform, the chatbot overcomes geographical and time constraints that often limit access to traditional mental health services. This accessibility is particularly crucial for working-aged individuals who may face challenges in seeking face-to-face professional help. The integration of Buddhist principles with evidence-based psychological interventions is expected to resonate strongly with Thai users. This culturally sensitive approach may lead to higher engagement and effectiveness

compared to interventions based solely on Western psychological models. Moreover, it could serve as a model for developing mental health interventions in other cultural contexts, particularly in Asia, where users might be more likely to enjoy interacting with, and demonstrate increased propensity to anthropomorphize technology (Folk et al., 2023). Research indicates that East Asian cultures (which also deeply influence Thai society), tend to attribute mental states and human-like qualities to robots (Spatola et al., 2022). This phenomenon could potentially enhance engagement with AI-driven tools like SabaiJai, though it remains to be seen if this extends fully to chatbot systems.

SabaiJai's development contributes to the growing field of AI-assisted mental health interventions. The chatbot's use of advanced natural language processing, coupled with a structured intervention program, represents an innovative approach to delivering mental health support. This model could inform future developments in digital mental health tools, particularly in non-Western contexts. While initially focused on working-aged Thai individuals, the SabaiJai model has the potential for broader applications. If proven effective, the chatbot could be adapted for different age groups, occupational sectors, or even other Southeast Asian countries with Buddhist influences. The scalability of the digital platform allows for reaching a large number of users at a relatively low cost, potentially making significant impacts on population-level mental health outcomes. Beyond its immediate effects on individual users, SabaiJai has the potential to contribute to broader mental health awareness and destigmatization efforts in Thailand. By normalizing conversations about stress and mental well-being, and by providing easily accessible support, the chatbot may play a role in shifting societal attitudes towards mental health. In conclusion, the expected outcomes and benefits of SabaiJai extend beyond individual stress management to encompass broader impacts on mental health care accessibility, cultural integration in psychological interventions, and innovation in digital mental health.

Limitations and Future Directions

While this paper provides a comprehensive account of SabaiJai's conceptualization, theoretical framework, development and integration of cultural elements with modern psychological techniques, it does not present empirical results from a large-scale randomized controlled trial (RCT). The absence of RCT data is a notable limitation, and we acknowledge that robust efficacy testing is essential. However, the primary objective of this paper is to document the development process and user-centered design, grounded in qualitative feedback from interviews with meditation masters, Buddhist scholars and potential users. Therefore, the RCT will be implemented

in a future phase of our research, providing rigorous evaluation of SabaiJai's effectiveness. Preliminary feedback indicates strong user engagement and interest, though this may reflect a novelty effect or the appeal of AI technology rather than confirmed intervention efficacy. Future RCTs will be crucial in distinguishing between engagement driven by cultural relevance and technological novelty. Additionally, SabaiJai's tailoring to Thai culture and Buddhist principles may limit generalizability to other populations. However, this cultural specificity addresses a significant gap in digital mental health interventions and offers a model for developing culturally-adapted tools in other contexts. Future research could explore adaptations for different cultural or religious backgrounds, expanding the applicability of this approach. The integration of GPT-4o for free-chat functionality represents an innovative use of AI in mental health, though it presents challenges in ensuring consistent, clinically appropriate responses. Ethical considerations are paramount, and future iterations will incorporate advances in AI and natural language processing to enhance cultural sensitivity and clinical soundness. In summary, while the lack of large-scale efficacy data necessitates cautious interpretation, this study aims to lay a solid foundation for future empirical validation and highlights the importance of culturally-tailored AI interventions in digital mental health.

Conclusions

This study set out to achieve multiple objectives in the development of SabaiJai, an AI-powered chatbot aimed at enhancing stress resilience among working-aged Thai individuals. Each of these objectives has been systematically addressed, contributing to the field of culturally-adapted digital mental health interventions.

1. The design and implementation of SabaiJai successfully integrated Buddhist teachings with modern psychological stress management techniques. By embedding the Five Spiritual Powers (pañcabala) within the chatbot's framework and aligning them with contemporary resilience theories, SabaiJai offers a holistic, culturally resonant approach to stress management.

2. Expert feedback played a crucial role in shaping the chatbot's content and functionalities. Insights from mental health professionals and Buddhist scholars informed the ethical boundaries, content accuracy, and cultural relevance of the intervention, ensuring that SabaiJai met both the psychological and spiritual needs of its users.

3. A user-friendly interface accessible via the LINE messaging application was developed, addressing the objective of ensuring broad accessibility, without registration requirements or any barrier to entry. The familiar platform enhances user engagement and reduces technological barriers.

4. The 10-day structured intervention program, comprising psychoeducation, daily exercises, and interactive components, was successfully created and implemented. This program provides users with practical tools and knowledge for enhancing stress resilience, rooted in both Buddhist and psychological principles.

5. State-of-the-art AI technology, specifically GPT-4o, was integrated to enable personalized, free-form conversations. This feature enhances user interaction by providing tailored responses that align with both user needs, while the AI's system prompt directs the responses to adhere to cultural context.

6. The incorporation of user-requested features, identified through potential user assessments, ensured that SabaiJai addresses the specific needs and preferences of its target demographic. Features were directly influenced by user feedback.

7. Preliminary user feedback indicated strong interest and engagement with SabaiJai, providing evidence for its potential as a culturally-sensitive stress resilience tool.

To summarize, SabaiJai represents a promising advancement in digital mental health support, blending cultural authenticity with technological innovation. Future research should focus on comprehensive efficacy testing and further refinement, with the aim of solidifying SabaiJai's role in enhancing stress resilience among Thai working-aged individuals and potentially adapting the model for other target groups. In conclusion, while SabaiJai is still in its early stages, we are optimistic that its development represents a step in the right direction in the evolution of digital mental health interventions. By combining cultural sensitivity, psychological insight, and technological innovation, it offers a model for creating more diverse, accessible, and potentially more appealing mental health support tools. To ensure long-term efficacy, future efforts should focus on continuous user feedback and iterative refinement, conducting longitudinal studies to assess potential sustained impact. Advancements in AI can further enhance personalization, while regular updates can help maintain relevance. As we move forward, continued research, user engagement, and ethical consideration will be crucial in realizing the full potential of such interventions to improve mental health outcomes both in Thailand and on a global scale.

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Ethics Statement

The study was approved by the Institutional Ethics Committee of the authors' affiliated institution under case number R.218/2024 on 20th April, 2024.

Author Contributions

Nadnapang Phophichit: Conceptualization, methodology, investigation, funding acquisition, resources, data curation, writing—original draft preparation, writing—review and editing; Phuen Kittisobhano: supervision, conceptualization; Weerasak Abhinandavedi: conceptualization, writing—review and editing; Nuntawit Dhirabhaddo: conceptualization, writing—review and editing; Nopadol Penprachoom: conceptualization, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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