



# Smartphone-Based Spiritual Support Applications to Overcome Anxiety in Emergency Unit Nurses during the COVID-19 Pandemic: Extended Rapid Application Development

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## Abstract

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**BACKGROUND:** Spiritual assistance cannot be provided ideally to emergency room (ER) nurses facing anxiety during the COVID-19 pandemic. It is because of the clergy's restrictions and the available time.

**AIM:** This study aimed to develop an independently usable smartphone-based spiritual support application.

**METHODS:** This study is an extensive rapid application development (ERAD). Four specialists in spirituality, music, psychology, and information technology evaluated the Muzida Spiritual Support (MSS) prototype's validity and reliability. Thirty-two ER nurses who handle COVID-19 patients were subjected to prototype acceptance tests.

**RESULTS:** The content validity test demonstrates a high level of accessibility for content accuracy (0.9), rhythm and tempo compatibility (0.8), and the relaxing impact that results (0.8). Intraclass correlation coefficients (ICC) values indicate that the MSS application is reliable (0.71). The mean  $\pm$  standard deviation (SD) application interface score  $7.84 \pm 1.25$ , the voice clarity aspect  $8.9 \pm 1.28$ , the ease of use  $7.56 \pm 1.31$ , the effect on reducing anxiety  $7.65 \pm 1.21$ , the boost effect  $8.0 \pm 1.16$ , the happiness effect  $8.03 \pm 1.32$ , and the calming effect  $8.1 \pm 1.32$ . The mean  $\pm$  SD acceptance score is  $8.06 \pm 0.44$ , indicating that the user can run MSS very well.

**CONCLUSION:** The prototype of the MSS application has adequate validity, reliability, and acceptability, so it is suitable for use as a therapy.

## Introduction

Coronavirus Disease 2019 (COVID-19) has spread swiftly across five continents, affecting 210 nations. In April 2020, the number of cases reached 2,206,690 but rose to 63,706,720 within 7 months. Similarly, the death toll increased from 148,663 to 1,476,691. As a result, around 8.7 million new cases and 189,718 deaths occur each month [1].

Nurses are more likely to experience psychological discomfort than other health professionals since they are actively involved in the care of COVID-19 patients. The primary causes of psychological distress among health-care professionals are a lack of knowledge about COVID-19, an insufficient supply of personal protective equipment, an insufficient amount of rest, a heavy workload, the risk of infection, and the possibility of transmission to family members at home [2], [3].

The increasing number of incidences of patient

dishonesty in Indonesia exacerbates the problem because infecting the nursing personnel who treat them. COVID-19 has symptoms and signs similar to those of other tropical diseases such as dengue fever and typhoid. In addition, there are cases of COVID-19 infection that are asymptomatic or subclinical. This reality causes worry and confusion among emergency department nurses [4].

Anxiety is the initial psychological disorder that arises [5]. Improper handling can exacerbate anxiety, creating stressors that impair nurses' physical and psychological health. Prolonged stress can negatively impact the immune system, making it more prone to infection. Anxiety and dread are also disruptive to job satisfaction and motivation during the COVID-19 outbreak [6]. It explains why hospital management must provide mental health support to health-care staff that interact with COVID-19 patients [7]. Anxiety is a typical symptom that health workers in Indonesia have reported experiencing during the COVID-19 outbreak. According to a study of 384 health-care employees,

57.6% reported experiencing anxiety [8]. Another study corroborated the widespread anxiety experienced by health-care workers during the COVID-19 epidemic, with 76.6% of 86 respondents experiencing anxiety [9].

Psychological skills training for health-care professionals are recommended as mental health support. Direct intervention might be provided by psychiatrists, psychologists, or psychiatric nursing specialists [5]. However, this procedure is time-consuming and requires specialized personnel. In addition, this procedure can only be performed in a well-equipped health-care facility. In addition, the pandemic is worsened by a lack of personnel and resources to deal with the growing number of casualties. As a result, research is required to develop methods for managing anxiety that is simpler, more effective, and self-sufficient.

Developing coping techniques is a fundamental aspect of anxiety management. This technique assists an individual in adapting to perceived stressors, changes, and disruptions in satisfying life's needs. There are five approaches to strengthening coping mechanisms: cultivating an optimistic outlook, utilizing social support, utilizing spiritual resources, exerting control over situations and emotions, and accepting the reality he encounters [8].

Dhikr is a kind of spiritual healing that Muslims in good and bad health often do [11], [12], [13]. Prayer is one of the most frequently practiced spiritual activities across all religions and belief systems [14]. Spirituality is a reflection of one's life's most profound significance. Numerous psychological issues, including stress, anxiety, self-concept, self-image, self-esteem, coping, dignity, and interpersonal connections, are founded in an individual's spiritual dimension [9]. Along with dhikr and prayer, music has a long history of serving as a spiritual companion. Music is regularly incorporated into religious activities to aid prayer and faith-strengthening [10]. Music is also generally recognized for its physiological advantages, including its sedative effect on pain and stress [11].

This study aims to create a smartphone application that will enable the early diagnosis and treatment of anxiety. Muzida Spiritual Support (MSS) is a program that mixes music listening, dhikr, and prayer. MSS is more acceptable to Muslims than other religious nurses because it involves dhikr. The anxiety assessment tool provided in this application, the Global Anxiety-Visual Analog Scale (GA-VAS), is valid and may detect changes in an individual's anxiety intensity over time [12]. A previous study has found no evidence that smartphone applications can be utilized to assist nurses in managing their anxiety. In prior studies, smartphone applications were used to alleviate the anxiety of pre-operative pediatric patients and anxious teenagers [19], [20].

The urgency of this study comes from the need for spiritual support for anxiety-prone emergency

care nurses. Appropriate spiritual support can help ER nurses feel more relaxed and motivated to give highly professional care. In addition, anxiety monitoring devices can assist nurses in keeping an eye on their state of anxiety.

Studies have been conducted on the benefits of sound therapy for anxiety and other health concerns, along with dhikr, prayer, and music. However, because the sound therapy is administered manually via an MP3 player, it is impractical, even more so when many types of sound therapy are combined. This study is novel in that it combines music, dhikr, and prayer; it is given through a smartphone application, and the subjects are emergency department nurses [19]. This study aims to create a smartphone application that provides spiritual support. The application is expected to aid ER nurses in managing anxiety in the event of a COVID-19 pandemic.

## Methods

Extended rapid application development (ERAD) is the research process used to produce MSS applications. ERAD refers to the process of developing MSS programs, which includes interface design, prototyping, testing, and implementation [13]. The steps of ERAD are depicted in Figure 1.

The interface design process comprises three stages: comprehending, deviating, and deciding [14], [15]. Four professions are involved in the interface design process. They consist of music, spirituality, psychology, and information technology professionals. Musicians classify and rank the results of soothing music search engines. Psychologists explain how to conduct a psychological evaluation. Spiritual counselors contribute to the development and evaluation of prototype spiritual values. Informatics Technology experts contribute to selecting the optimal smartphone operating system and prototype-based application design [14], [15].

The interface design stage produces a low-fidelity design, then upgraded to a high-fidelity design and prototype. The understanding step focuses on human values and shows the user precisely what design is needed. During the divergence step, the team must define or solve the challenge. The problems gather during the comprehension stage. During the divergence step, the team establishes a critical strategy for the task. During the decision-making step, the entire team works together to select the best ideas to form the basis of the prototype. Incorporating the design sprint method early in system development will likely enhance the experience and speed up project execution [14], [15].

A minimum viable product (MVP) is created through prototyping. An MVP satisfies users and solicits

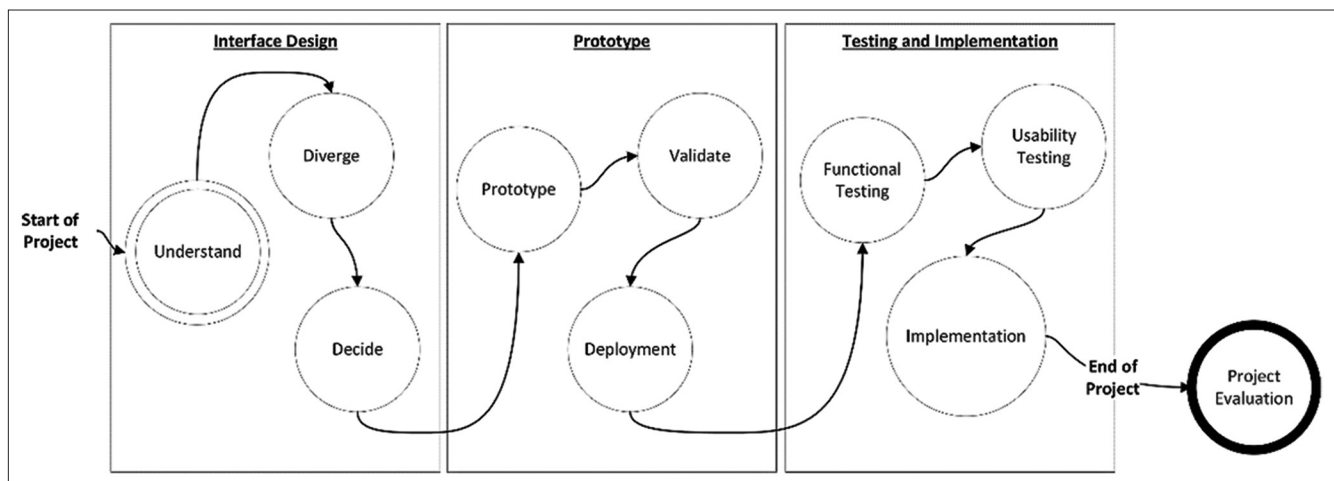


Figure 1: Extended rapid application development

feedback. This MVP was created by prototyping the broad concept obtained during the interface design stage, and the initial iteration took approximately 4 days to complete. Prototyping and validation is a collaborative effort involving developers, designers, users, and experts. During the prototype stage, design changes are evaluated and agreed on. Experts examine the prototype's validity and reliability to determine its suitability for usage as a therapeutic method. Finally, the development team implements the prototype into the application [14], [15].

Functional testing is essential to ensuring that the application operates as expected. The entire quality of software programs is influenced by functional testing [16]. In comparison, acceptance testing assesses the effectiveness, efficiency, and user satisfaction of a product. The implementation process begins with the installation of the MSS application and continues with the preparation of user manuals and system training. Participants in the acceptance test included emergency room (ER) nurses from Goeteng Taroenadibrata Hospital in Purbalingga, Central Java, who handled patients during the COVID-19 epidemic [14], [15].

The acceptance test was conducted using total sampling. Thirty-two ER nurses who were responsible for the care of COVID-19 patients matched the inclusion criteria. The acceptance test considers a variety of variables, including the app's interface, voice clarity, usability, and impact on anxiety, encouragement, happiness, and tranquility. In addition, responders to the acceptance test provided input on difficulties encountered while using the prototype and suggested improvements.

The evaluation stage of the project is a follow-up technique for iteratively developing the prototype in response to expert feedback and ideas, as well as acceptance test results. It attests to the prototype's therapeutic viability. Respondents are participating voluntarily in this study. Before respondents signed the informed permission form, the researcher outlined the study's purpose, benefits, and methodology.

Prototype development experts have a minimum of 5 years of expertise and are actively involved in this study. This study is being conducted by four experts: music experts, spiritual experts, psychologists, and software engineers. Apart from a willingness to participate in the acceptance test, respondents must meet the inclusion criteria of providing ER care during the COVID-19 epidemic and being Muslim.

The Aikens'V formula was used to determine the prototype's validity. Because the data are continuous with more than two raters, the technique for determining rater dependence is based on the intraclass correlation coefficient (ICC) [13]. Analysis of data using computer programs.

The Ethics Board of the Faculty of Health Sciences, Jenderal Soedirman University, Central Java, Indonesia, approved this study (No 450/EC/KEPK/V/2021). The Helsinki Declaration was followed in conducting this investigation.

## Results

This study spanned 4 months (June–September 2021), beginning with the interface design stage and concluding with the project evaluation.

### Interface design stage

The first stage of MSS development is interface design, which entails user needs study, content analysis, and the development of any necessary tools. This phase involves a team of four individuals, including musicians, spiritual advisors, psychologists, software developers, and nurses. The user needs analysis is designed to ascertain the user's requirements, most notably the spiritual support needed by ER nurses during the epidemic. Music, dhikr, and prayer are all

involved in the composition. The tool needs analysis aims to ascertain the equipment required to perform MSS operations. Table 1 summarizes the results of the analysis.

**Table 1: MSS development analysis stage**

S. No.	Type of analysis	Result
1.	User requirement analysis	ER nurses need a spiritual support model that can be done independently because of the limitations of the clergy.
2.	Content analysis	The content that can be used is relaxation music, dhikr, and prayer because it has been proven to have a calming effect in previous studies.
3.	Equipment analysis	The equipment needed is a smartphone and headphones.

MSS: Muzida spiritual support.

Four professionals collaborate throughout the planning stage: spiritual, musical, psychological, and information technology specialists. IT professionals assisted in creating the MSS application’s operating system and workflow and built MSS on the Android operating system, the world’s most popular smartphone platform. As shown in Figure 2, the information technology specialist described the MSS application procedure in full. The application was created for nurses working in ER.

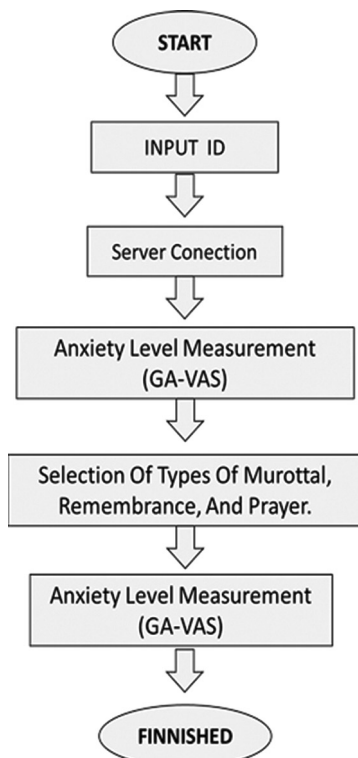


Figure 2: Muzida spiritual support workflow

There are five primary operational procedures: user identification, pre-anxiety level measurement (GA-VAS), MSS type selection, MSS playback, and post-anxiety level assessment (GA-VAS).

The MSS Application is accessed through registering (as a new user) and logging in (as a registered user), as demonstrated in Figure 2. The following step is to enter patient data and determine the patient’s pre-anxiety score. After that, the user can customize the MSS content according to his or her tastes. The next step is to do the MSS to initiate therapy.

After the therapy was completed, a post-anxiety score assessment was conducted. The application is ended when the logout button is pressed.

MSS is composed of soothing music, dhikr, and prayer. YouTube is used to find relaxing music and dhikr. The search term “relaxation music OR relaxation music” is used to locate relaxation music. “zikir OR dhikr” is the search term used to locate dhikr content. Instrumental relaxation music was chosen based on professional recommendations to prevent interfering with the song’s words. The varieties of dhikr recitation are well-known and frequently performed, including *tasbih (Subhanallah)*, *tahmid (Alhamdulillah)*, *Takbir (Allahu Akbar)*, *Tahlil (Lailaha ilallah)*, and *istighfar*. Simultaneously, prayer use for sick people was found in a previous study [14].

Four experts assessed the content of MSS (music, spiritual, psychological, and IT). Computer software is used to modify the tempo and duration of MSS’s material. The tempo is reduced to <100 times/min for 30 min using computer software. After that, the MSS content is given to software developers for integration into the MSS application.

Designers convert detailed sketches into low- or high-fidelity designs. The MSS’s low-fidelity design is shown in Figure 3. The design team chose eight user interfaces.



Figure 3: (a-d) Muzida spiritual support prototype sketch

The low-fidelity design depicted in Figure 3 attempts to translate a concept sketch into a tested

item that may be used to collect and analyze early feedback. Low-fidelity design is a straightforward and uncomplicated notion. Figure 3 depicts four of the top eight suggestions. Figure 3a illustrates the login page, Figure 3b illustrates the registration page, Figure 3c illustrates the MSS home page and Figure 3d illustrates the patient demographic data.

Together with system interface requirements, team members addressed additional system requirements, such as technical, functional, and informational. Minimum memory requirements are 4 GB; recommended memory requirements are 8 GB; minimum accessible disk space requirements are 2 GB; recommended disk space requirements are 4 GB (500 MB for IDE + 1.5 GB for Android SDK and emulator system image). A minimum screen resolution of 1280 × 800 is required per the operational environment standards. Simultaneously, Microsoft Windows 7/8/10 (64-bit) and Android Studio, as well as Visio, are applications needed.

The functional requirements for the system include demographic information about the user, MSS components (music, dhikr, and prayer), and health parameters. Age and duration of therapy were included as demographic variables. MSS content is selected using the MSS component. Before and following therapy, health parameters were in the form of anxiety measurements.

**Prototype stage**

Validation and prototyping occur due to collaboration between developers, designers, and users throughout the prototype stage. They collaborate to produce the best design possible. Prototypes generate both tangible and intangible experiences [15]. A page set tailored for high-fidelity MSS applications is depicted in Figure 4.

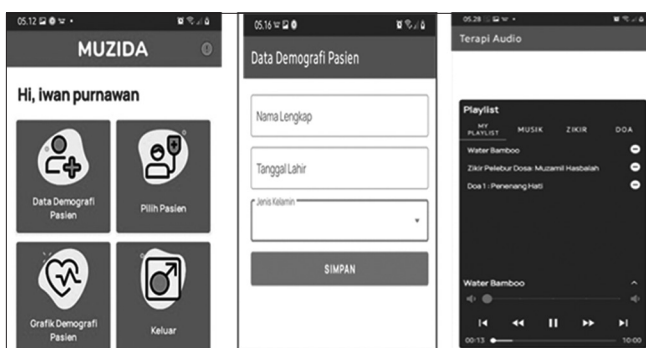


Figure 4: High-fidelity interface on Muzida spiritual support

Implementing a high-fidelity design can be straightforward because the user has already seen a rough sketch of the prototype. In addition, users participate actively in creating the system, establishing a line of contact between developers and users.

Searching MSS content on YouTube for soothing music and dhikr, identified 15 kinds of

relaxation music and ten different types of dhikrs. The song's tempo has been altered to maintain a beat rate of fewer than 100 beats/min. In addition, the sound level of each content is equalized to avoid the user being inconvenienced by the variation in sound. The various processes of MSS application content compilation are depicted in Figure 5.

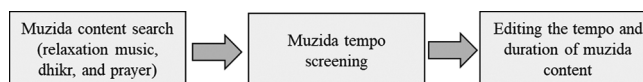


Figure 5: Stage of compiling Muzida spiritual support content

**Testing and implementation stage**

The prototype's validity and reliability were determined by four experts with more than 5 years of professional experience in their respective domains (music, spirituality, psychology, and information technology). The content, rhythm, tempo, and relaxing impact of MSS are all evaluated. The Aiken V formula was used to calculate the expert agreement index (Appraiser Agreement) to validate the prototype [15].

$$V = \frac{\sum s}{(n[C - 1])}$$

Information:

v: validity

s: R–Lo

Lo: lowest rating score

C: highest rating score

R: the number given by the rater.

Table 2 contains the results of the validity tests conducted on each test component. Rater Agreement is estimated using the Aiken V formula and ranges between 0.875 and 1. It demonstrates the TSAD's remarkable validity [16].

Table 2: Muzida prototype validity test results

S. No.	Assessment component	Validity value
1.	Content	0.9
2.	Rhythm and tempo	0.8
3.	Calming effect	0.8

The MSS prototype reliability test uses inter-rater reliability to assess the agreement between raters on an intervention. The technique for calculating reliability between raters uses ICCs because apart from 4 appraisers (>2 people), the data is also continuous [13]. The ICC test results show a result of 0.714 which means it has adequate reliability. Based on the validity and reliability of the tool, the prototype of MSS's is suitable for use as therapy.

The user acceptance test is a stage of the MSS application development process that identifies user evaluations of the prototype's performance. The acceptance test was conducted on groups known

to be anxious, specifically ER nurses who handled COVID-19 patients. The acceptance test respondents' characteristics are summarized in Table 3.

**Table 3: Characteristics of acceptance test respondents**

Characteristics	Total*	Percentage
Age		
Early adulthood (26–35 years)	10	31.3
Late adulthood (36–45 years)	15	46.9
Early elderly (46–55 years)	6	18.8
Late elderly (56–65 years)	1	3.1
Gender		
Man	19	59.4
Woman	13	40.6
Education		
Diploma III	16	50
Professional Nurse	16	50
Working period		
New (<1 year)	6	18.8
Currently (1–5 years)	7	21.9
Long (>5 years)	19	59.4

\*32 respondents.

As shown in Table 3, most respondents (78.2%,  $n = 32$ ) were adults with long tenure (59.4%,  $n = 43$ ). The distribution of sexes and educational levels is fairly similar. Each respondent is a member of the patient care team for COVID-19.

The MMS app acceptance test assesses seven factors: the app's appearance, its simplicity of use, its voice clarity, and its ability to reduce anxiety, encourage, and promote serenity. The results of the acceptance tests are summarized in Table 4.

**Table 4: Muzida application acceptance test results**

S. No.	Indicator	Mean $\pm$ SD	Min–Max
1.	Application interface	7.84 $\pm$ 1.25	3–10
2.	Voice clarity	8.9 $\pm$ 1.28	6–10
3.	Ease of use	7.56 $\pm$ 1.31	4–10
4.	Effect on anxiety	7.65 $\pm$ 1.21	4–10
5.	Encouraging effect	8.0 $\pm$ 1.16	6–10
6.	Happiness effect	8.03 $\pm$ 1.32	5–10
7.	Calm effect	8.1 $\pm$ 1.32	3–10
	Acceptance score average	8.01 $\pm$ 0.44	7.56–8.90

SD: Standard deviation, Min–Max: Minimum–Maximum.

The acceptance score has a mean  $\pm$  standard deviation of 8.01  $\pm$  0.44, as shown in Table 4. This demonstrates how effective MMS is at alleviating anxiety.

### **Project evaluation stage**

The MMS prototype was created in 38 days using the ERAD method. This methodology consists of two phases: interface design and prototype development. Although the main features have been thoroughly created and tested, they still require adjustments, refinements, and design developments according to the advice of experts.

According to the ER nurses involved in the acceptance test, the MMS prototype has a calming effect to be used in clinical care. Some suggestions for improving the MSS application include expanding MMS content, especially music and dhikr, and simplifying adding MMS content to playlists. MSS applications require clinical trials with a more significant number of respondents.

## **Discussion**

Android is growing in popularity and is now the most widely used mobile operating system. It is applied in nearly every area, including engineering, education, and health. It is because Android is an open-source operating system. Android's license allows for free software modification [17], [18], [19].

The prototype's validity and reliability testing by four experts established that MMS was appropriate for use as a therapy to alleviate ER nurses' anxiety during the epidemic. Acceptance test results indicate that the average score reached 8.06 (range of values 1–10).

Two factors become markers of the MMS prototype's therapeutic feasibility: its technical implementation and consequent therapeutic effect. The first to third points, namely facial appearance, voice clarity, and simplicity of usage, indicate the MMS prototype's ease of use during the acceptance test. It substantially supports the research's primary purpose: to provide spiritual support that may be used independently, particularly during times of increased effort and scarcity of resources, such as during a pandemic.

The acceptance test, conducted on 32 ER nurses at the Goeteng Taroenadibrata Hospital in Purbalingga, Indonesia, demonstrated that, in addition to being simple to use, the MMS application has a beneficial effect on bringing one closer to God, encouraging and bringing peace and happiness. It is the therapeutic effect of the Muzida application's constituent aspects, such as music, dhikr, and prayer [21], [22], [23]. A systematic review of nine research including 421 participants, established that music therapy can significantly lower depression levels in the short term [23]. Another study demonstrated that music therapy could dramatically reduce postoperative pain and anxiety [24].

Music has a therapeutic effect by synchronizing the body's rhythms, which reduces the sympathetic nervous system's activity and decreases adrenergic hormones. Following this state of relaxation, the heart rate, respiration rate, muscle tension, and blood pressure all drop [25]. It is also the effect of auditory stimulation by music on the brain's limbic system, which serves as the hub of emotions, moods, and sensations by impairing neurotransmitters' ability to convey discomfort signals. In addition, it stimulates the release of endorphins, which provide the body with a sense of well-being [26].

Multiple prior research has established that Dhikr, a component of MMS, has a soothing effect. Dhikr has been shown significantly reduce anxiety in cancer patients and pain intensity in postoperative patients [27], [28], as well as to improve postoperative sleep quality in patients [21].

Dhikr is a highly recommended religious activity for Muslims since it is thought to provide serenity to the spirit, induce a soothing impact on the body, and alleviate worry. Spiritual practices conducted with sincerity and mindfulness can elicit pleasant emotions such as wealth, happiness, and optimism [29], [30].

Prayer as a component of MMS is a religious activity frequently practiced by people from various religions and belief systems. 85% of people pray weekly in the United States compared to 55% in Canada [31]. Prayers are regularly used before and following all activities to instill a sense of serenity and hope. There is a strong association between prayer and an improvement in well-being and self-confidence and a decrease in anxiety and depression [32], [33].

### Limitation

This study serves as the foundation for developing spiritual support applications for mobile devices. Clinical studies examining the usefulness of spiritual support applications in lowering anxiety have not been done. Thus far, the studies have been limited to expert validation and reliability assessment. Acceptance tests on ER nurses determine how users feel about the application's quality and usability. Although additional testing is required, the MSS has good validity and reliability and a favorable usability score. Due to the fact that this application is only available to Muslim nurses due to the dhikr in MSS, it requires additional development to ensure that it is suitable for people of all religions and belief systems.

### Conclusion

The MMS application has progressed to the interface design, prototyping, and testing stages. The user interface, which consists of low-fidelity and high-fidelity components, was designed during the interface design stage. At the prototype stage, a high-fidelity design is generated that can be utilized to run pre-configured applications on Android handsets instantly. The ERAD technique combines design sprints and rapid application development concepts in the systems development cycle. The development of an MMS application takes fewer than 60 days. Acceptability was determined to be 8.06 based on the results of functional testing performed utilizing the acceptance test. MMS is a highly effective treatment for anxiety. Clinical investigations with a larger sample size are required immediately to determine whether MSS is clinically helpful at lowering anxiety. Modifications to the MSS content are also required to make it suitable for usage with people of diverse religions and belief systems.

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