

## Effectiveness of Smartphone-Based Spiritual Nursing Care on Anxiety in Children

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### ABSTRACT

**Background:** Hospitalization is a significant stressor in children and is frequently associated with heightened anxiety. Although spiritual care interventions have shown psychological benefits, evidence regarding digital spiritual nursing intervention in pediatric settings remains limited.

**Purpose:** To evaluate the effectiveness of smartphone-based spiritual nursing care in reducing anxiety among hospitalized children.

**Methods:** A quasi-experimental nonrandomized controlled pretest-posttest study was conducted in the pediatric inpatient ward of an Islamic hospital in Indonesia. Sixty children aged

under 18 years were recruited and allocated to the smartphone-based application Spiritual Islamic Nursing Care (SINC) group (n=30) or the control group receiving hospital-based murottal therapy (n=30). This study uses consecutive sampling. The intervention was delivered once daily for three consecutive days. Anxiety was measured at baseline and post-intervention using a validated observation sheet. Within-group changes were analyzed using the Wilcoxon signed-rank test, and between-group differences were assessed using the Mann-Whitney U test. Effect sizes were calculated using r statistics.

**Results:** Both groups demonstrated significant reductions in anxiety scores following intervention ( $p < 0,001$ ). The reduction in anxiety was significantly greater in the SINC group compared with control group ( $p = 0,001$ ;  $r = 0,44$ ), indicating a moderate effect size.

**Conclusion:** Smartphone-based spiritual nursing care demonstrated greater effectiveness than standard spiritual therapy in hospitals in reducing anxiety among hospitalized children. Digital spiritual interventions may offer a scalable and culturally responsive approach to integrating spiritual care into pediatric nursing practice.

### Keywords:

anxiety; digital health intervention; hospitalized children; pediatric nursing; spiritual care; qur'anic recitation

## **BACKGROUND**

Hospitalization is a well-recognized source of stress among pediatric patients, often eliciting anxiety, fear, and emotional distress. The incidence of hospitalization in children is increasing every year. In the United States, it is estimated that the incidence of hospitalization of children is more than 4-5 million a year due to surgery, injury, and various other causes. In Indonesia, data from the Ministry of Health shows that the incidence of hospitalization in children is 45%, which is an increase of 13% compared to the previous year (Diandini et al., 2023).

Anxiety in children is a psychological problem that can affect their emotional development and mental health. During hospitalization, children may experience feelings of separation, loss of autonomy, and exposure to unfamiliar environments and procedures, leading to negative psychosocial outcomes that can affect recovery and long-term wellbeing. Effective nursing interventions aimed at addressing such psychological responses are therefore integral to holistic pediatric care and improved clinical outcomes (Collins et al., 2018; Diandini et al., 2023).

Various approaches have been taken to address anxiety in children, including pharmacological and non-pharmacological interventions. Non-pharmacological methods, like spiritual therapy, have gained increasing attention because they have minimal side effects and are easy to use. Spiritual nursing care has been shown to be effective in reducing anxiety in various groups of patients, including children. A study in children with cancer showed that spiritual care significantly reduced anxiety levels (Vazifeh doost et al., 2020). Another study in children with immunodeficiency disease found that spiritual activities, such as painting prayers, significantly reduced anxiety levels (Zarei et al., 2020). Fulfilling spiritual needs can minimize anxiety in hospitalized patients (Arbianingsih et al., 2017). Another study found that the intervention approach using the Spiritual Islamic Nursing Care (SINC) application was effective for meeting the spiritual needs of patients (Amal et al., 2021).

Murottal has the potential to alleviate anxiety in children, in addition to its role in spiritual nursing care interventions. Experimental quasi-studies conducted by Salsabillah et al. (2023) found that murottal therapy with Surah Ar-Rahman was effective in reducing anxiety levels in students. Studies conducted by Moulaei et al. (2023) stated that several studies found the effectiveness of reading and listening to the Qur'an as a non-pharmacological therapy to reduce anxiety (45%), stress (30%), and depression (25%). Results from Rumakamar et al. (2022) showed that the administration of Murottal Al-Quran therapy could reduce the level of hospitalization anxiety in children ( $p < 0.001$ ). According to it, it was revealed that murottal therapy is moderate superiority at reducing anxiety and stress and the hormone cortisol compared to music therapy (Irmawati et al., 2020; Jafaripur et al., 2019).

Spiritual care that respects and responds to the spiritual needs of patients has been increasingly recognized for its role in enhancing psychological adaptation and emotional stability across various clinical contexts. Systematic reviews indicate that spiritual interventions delivered by healthcare providers, including nurses, can reduce anxiety,

depression, and psychological distress while enhancing overall well-being compared to control conditions without spiritual care components (Dos Santos et al., 2022).

Many studies have found that spiritual activities and murottal are effective in reducing anxiety at various age levels. However, in pediatric population, effective interventions often need to be active, engaging, and developmentally appropriate. Research that assesses the effectiveness of spiritual care using smartphone-based applications in children's groups in reducing anxiety levels in children is still limited, and the mechanism through which these effects occur especially among children, remains underexplored.

Spiritual nursing care for pediatric anxiety can be conceptualized using frameworks for multicomponent intervention, which consist of several interacting components that may influence outcome through multiple mechanisms acting as stimulants (Skivington et al., 2021). In contrast, single-component interventions involve a single active element targeting a specific outcome pathway. Clinically, multicomponent interventions may produce larger and more sustained psychological responses because their multiple active sources can engage diverse coping mechanisms, including meaning-making, emotional regulation, and spiritual connectedness.

By comparing a digital multicomponent spiritual nursing care intervention with a single-component murottal therapy, this study aims to contribute novel evidence regarding both the efficacy and the underlying mechanisms of spiritual approaches tailored to pediatric hospitalization. Understanding these differences can inform nursing practice and the design of holistic interventions that better address children's psychosocial needs within clinical care.

## **OBJECTIVE**

This study aimed to evaluate the effectiveness of smartphone-based spiritual nursing care compared with hospital-based spiritual therapy in reducing anxiety among hospitalized children.

## **METHODS**

This study employed a quasi-experimental nonrandomized controlled pretest-posttest design. The study was conducted in the pediatric inpatient ward of an Islamic hospital in Makassar, Indonesia. The ward provides medical care for children with acute noncritical conditions requiring short-term hospitalization. Participants were eligible if they were children under 18 years old, hospitalized for at least 3 days, had parental consent, and owned a mobile phone. Children were excluded if they had cognitive impairment or developmental disorders, were in critical condition, or were receiving sedative medication.

Participants were recruited using consecutive sampling. Eligible children admitted during the study period were approached by the research team. After obtaining parental informed consent, participants were allocated into intervention groups based on ward admission flow to minimize contamination. A total of 60 participants were enrolled: 30 in the smartphone-based intervention group and 30 in the control group. No participants were lost to follow-up during the study. Sample size was determined based on the sample size

formula, which differs on average between the two groups with an alpha ( $\alpha$ ) value of 5%, a  $\beta$  of 80%, and a clinical difference of at least 30%. The sample size calculation uses Lwanga and Lemeshow's software for health research developed by WHO.

The smartphone-based spiritual nursing care using the spiritual Islamic nursing care application was delivered a minimum of once daily for approximately 15 minutes over three consecutive days. The SINC application included multiple integrated components: Qur'anic recitation (six selected surahs), morning and evening dhikr, du'a (healing prayers), thaharah guidance, prayer guidance, and a qiblat compass. The intervention was delivered individually under research team supervision and ensured that children and parents engaged actively with the content. The intervention is conceptualized as a multicomponent spiritual care program targeting reframing, emotional regulation, and spiritual coping mechanisms. To ensure consistency, we used intervention protocols, the research team received training on intervention delivery, and a statistics user was used to monitor adherence of intervention. The control group received hospital-based spiritual care. The hospital gives murottal therapy consisting of audio recitation of Qur'an. This intervention represents a single-component auditory spiritual stimulus designed to reduce anxiety through rhythmic recitation.

Children's anxiety was measured using an observation sheet that consist of nine items of anxiety response that can observed while in the hospital. Score 1 if the anxiety response appears and 0 if not. Higher scores indicate higher anxiety. This instrument adopt from previous study with validity coefficient range 0,194-0,666 and Cronbach's alpha reliability 0,73. Anxiety was assessed at baseline (day 1) and post intervention (day 3). All data were collected by a trained research team. Because anxiety scores were not normally distributed (Shapiro Wilk test,  $p < 0,05$ ), nonparametric tests were applied the Wilcoxon test for within-group comparison and Mann-whitney for between-group comparison.

Ethical approval was obtained from the Ethics Committee for Health Research. Written informed consent was obtained from parents, and verbal assent was obtained from children.

## RESULTS

### 1. Respondent Characteristics

Sixty participants completed the intervention and pre-posttest assessment, and were included in the final analysis. Baseline demographic and respondent characteristics were comparable between-group. The majority of children involved are girls, with a period of age in toddler, and dominantly have no hospitalization experience. Baseline equivalence testing confirmed that the intervention and control groups were statistically comparable. No significant differences were observed in sex distribution ( $p = 0.06$ ), mean age ( $p = 0,197$ ), or previous hospitalization history ( $p = 0,432$ ). The absence of statistically significant baseline disparities suggests that group allocation did not introduce systematic bias related to these characteristics. Consequently, post-intervention differences in anxiety outcomes are unlikely to be attributable to pre-existing demographic or clinical variations, thereby strengthening the internal

validity of the study and supporting the robustness of the intervention effect. For more details, please see the following table:

**Tabel 1.** Respondent Characteristics

Characteristic	Intervention		Control		p-value
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Sex:					0,06*
Boys	0	0	3	10	
Girls	30	100	27	90	
Age:					0,197**
Toddler	6	20	15	50	
Pre-school	6	20	7	24	
School age	9	30	4	13	
Adolescents	9	30	4	13	
Hospitalization History:					0,432
Yes	12	40	12	40	
No	18	60	18	60	

\*Pearson chi-square

\*\*Mann-whitney test

## 2. Effectiveness of Smartphone-based and hospital based spiritual care on Anxiety in Inpatient Children

The anxiety scores before and after the intervention showed the smartphone-based group showed a mean reduction of 4.26 points, while the hospital based group showed a mean reduction of 3.96 points. Even though both groups were statistically significant ( $p < 0.001$ ), descriptive analysis showed a greater median reduction in anxiety scores in the intervention group compared to the control group.

**Table 2.** Effectiveness of Smartphone-based and hospital based spiritual care on Anxiety in Children

Groups	Anxiety score (Scale 9)		Difference	p-value*
	pre	post		
Intervention	4,63	0,37	4,26	0,000
Control	5,13	1,17	3,96	0,000

\*Wilcoxon test

## 3. Differences in the Effectiveness of Smartphone-based and hospital based spiritual care on Anxiety in Inpatient Children Before and After Intervention

The effectiveness of the smartphone-based spiritual care compared to the control group that received hospital-based spiritual care showed a significant difference in effectiveness. The score decline in the intervention group was greater than in the control group at the end of the intervention. In the pre-test stage, the p-value (0.188) was greater than 0.05, indicating that there was no significant difference between the control group and the treatment before the intervention was performed. In other words, the initial anxiety levels in both groups were relatively similar.

After treatment, a p-value of 0.001 (less than 0.05) indicated a significant difference between the control and treatment groups. Because the treatment group (SINC) had a lower mean rank (23.47) than the control group (37.53), this suggests that the anxiety level in the treatment group was lower than in the control group after the intervention. For more details, please see the following table:

**Table 3.** Differences in the Effectiveness of SINC and Murottal on Children’s Anxiety

Anxiety Level	Anxiety		Z score	p-value*
	Mean Rank Intervention group	Mean Rank Control group		
Pre Anxiety	27,58	33,42		0,188
Post anxiety	23,47	37,53	-3.422	0,001

\*Mann Whitney

Post-intervention anxiety scores differed significantly between the two groups (Mann–Whitney U test,  $Z = -3.422$ ,  $p = 0.001$ ). The calculated effect size was  $r = 0.44$ , which represents a moderate effect size according to Cohen’s criteria. This finding suggests that although both interventions were highly effective within groups, the SINC app multicomponent intervention demonstrated a clinically meaningful advantage over the single-component murottal therapy in reducing anxiety. No adverse events were reported during the intervention period in either group.

## DISCUSSION

The findings support both interventions, either smartphone-based using a spiritual Islamic nursing care app or hospital-based spiritual using murottal therapy, significant reductions in anxiety in hospitalized children. However, the smartphone-based intervention demonstrated moderate superiority over hospital-based therapy in between-group comparisons. These findings add to the emerging evidence on non-pharmacological and culturally meaningful interventions designed to support pediatric emotional well-being during hospitalization.

Smartphone-based using the SINC app program suggests that multicomponent spiritual care, which includes Qur’an recitation, dhikr, healing prayers, prayer guidance, and other content provides additional psychological benefit beyond single-modality auditory spiritual therapy using murottal therapy. The effectiveness of multicomponent interventions may be attributed to their capacity to engage multiple psychosocial mechanisms simultaneously, including cognitive reframing, emotional regulation, and spiritual coping. This aligns with broader evidence indicating that structured, interactive, and multisensory interventions (e.g., play therapy, storytelling, VR) demonstrate stronger effects on anxiety and emotional distress compared with passive, single-modal approaches in pediatric settings. Systematic reviews highlight that therapeutic play and storytelling interventions significantly reduce anxiety and fear related to hospitalization, likely because of their capacity to provide meaning-making, emotional expression, and distraction simultaneously (Ku et al., 2025).

The SINC intervention’s multicomponent nature may enhance its therapeutic impact by targeting several dimensions of children’s responses to hospitalization simultaneously.

Combining guided prayer, reflective questions, and Qur'anic recitation may help children reframe stressful experiences, provide spiritual support, and make sense of their experiences, which fits well with ideas for complex health treatments. Furthermore, the inclusion of reflective elements may improve children's ability to reframe stressful experiences, which is critical for anxiety reduction during health-related stressors.

This aligns with literature highlighting the role of digital spiritual tools in facilitating psychological well-being that gave Ar Rahman murottal therapy to students and found a decrease in anxiety degrees after the administration of the intervention (Salsabillah et al., 2023). Listening to Murottal Al-Qur'an increases the quality of one's awareness of God. This awareness will cause total surrender to Allah SWT, and in this state, the brain is in alpha waves, which are at a frequency of 7-14 Hz. This frequency is the optimal state of the brain and can eliminate stress and reduce pain. In a calm state, the brain can think clearly and meditate on God's existence, coping, or optimistic hope in the patient. The chanting of verses of the Qur'an physically contains a human element. The human voice is an amazing instrument of healing and the most accessible tool. Sound can lower stress hormones, activate natural endorphin hormones, increase feelings of relaxation and distract from fear, anxiety, and tension, and improve the body's chemical system to lower blood pressure and facilitate breathing, heart rate, pulse rate, and brain wave activity. Such a deeper or slower breathing rate is perfect for calm, emotional control, deeper thinking, and better metabolism (Aprilliani et al., 2024).

When listening to the Murottal of the Qur'an, one notices a change in alpha brain waves. This change in alpha waves leads to increased concentration and comfort. This comfort causes a decrease in cortisol levels in *Rattus norvegicus* in a person who is given a Qur'anic murottal. Cortisol has several roles in the body: mediating stress response, metabolic regulation, inflammatory response, and immune function. The cortisol released by the adrenal cortex will alert the body when there is internal and external stress (Ainia et al., 2022).

Anxiety in hospitalized children is often caused by psychological factors such as unfamiliar environments, medical procedures, and a lack of security. When a person experiences anxiety, the sympathetic nervous system is activated, resulting in the release of stress hormones such as cortisol and adrenaline. The release of these hormones triggers physiological responses such as increased heart rate, blood pressure, and breathing. This stress response also reduces the activity of the parasympathetic nervous system, which is responsible for maintaining a calm state and emotional stability.

Both smartphone-based spiritual care interventions using the SINC app and murottal are effective in activating the parasympathetic nervous system and reducing the physiological response to anxiety. Interventions of dhikr, prayer, and murottal in the application of SINC, or murottal therapy, work with the exact mechanism, namely by increasing the activity of the parasympathetic nervous system, which plays a role in dampening the body's sympathetic response. This parasympathetic activation can lower cortisol levels and trigger feelings of calm, resulting in a reduced physiological response to stress and decreased anxiety.

The results of this study show that the SINC smartphone-based intervention showed higher effectiveness compared to murottal therapy. This is because smartphone-based spiritual care can be used more easily and widely anytime and anywhere, so it makes it easier for users to meet their spiritual needs (Bernstein et al., 2022). The SINC app also provides ongoing support and reminders through notifications, which can help keep the spiritual care they receive sustainable (Beresford & Norwood, 2022). The SINC application also involves many features to meet spiritual needs, not only audio murottal, but also prayer guides, healing prayers that can be read, dhikr therapy, and talqin. Smartphone applications make users choose spiritual therapy independently based on their needs and convenience. This causes users to feel more benefits from spiritual therapy and increases their involvement in therapy. Smartphone apps can integrate various aspects of spiritual health, including belief systems, connectedness, and the meaning of life, offering a holistic approach to spiritual care (Gorichanaz, 2022). Digital interventions can reach larger populations at a lower cost and reduce the burden on the healthcare system by providing remote support and monitoring and easing the workload of healthcare providers (Kim et al., 2021).

The findings have important implications for pediatric nursing practice. First, integrating structured spiritual care into standard pediatric care protocols may enhance child-centered care by addressing psychological and existential needs that are often overlooked in biomedical models. Comprehending and methodically integrating spiritual needs corresponds with the tenets of holistic care and may promote improved emotional outcomes for hospitalized children. Second, digital platforms offer scalable and feasible methods for delivering culturally congruent care, particularly in settings where access to in-person pastoral or chaplaincy services is limited.

Despite its strengths, several limitations warrant discussion. First, future studies should utilize randomized controlled trials with concealed allocation to establish stronger evidence. Second, the duration of follow-up was limited to three days; longer follow-up is necessary to ascertain the sustainability of anxiety reduction over time. Third, the study conducted only in the Muslim population may limit generalizability; however, this intervention may serve as a prototype for culturally congruent digital spiritual care that can be adapted to diverse faith contexts in future research.

## **CONCLUSION**

Both structured spiritual interventions, including multicomponent smartphone-based spiritual nursing care, and single-component hospital-based murottal therapy significantly reduce anxiety levels in hospitalized children. Smartphone-based spiritual nursing care interventions are more effective at decreasing anxiety scores in children. These results support the integration of contextually appropriate spiritual and digital care as a potential, practical, accessible, and holistic tool in pediatric healthcare settings.

## **ACKNOWLEDGMENTS**

This study was supported by institutional research funding. The authors sincerely thank the hospital administration, pediatric nursing staff, and participating children and their families for their valuable cooperation and contribution to this research.

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