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RESEARCH

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Exploration of Non-Pharmacological Interventions in Reducing Patient Anxiety in the Operating Room: A Scoping Review

Indra Maulana^{1a*}, Hesti Platini^{2b}, Salsabila Sakhi Fadila^{3c}

¹ Department of Psychiatric Nursing, University of Padjadjaran, Bandung, West Java, Indonesia

² Department of Medical Surgical Nursing, University of Padjadjaran, Bandung, West Java, Indonesia

³ Department of Nursing, University of Padjadjaran, Bandung, West Java, Indonesia

^a Email address: indra.maulana@unpad.ac.id

^b Email address: hesti13001@unpad.ac.id

^c Email address: salsabila22015@mail.unpad.ac.id

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Abstract

Preoperative anxiety is a common problem that impacts surgical outcomes and patient well-being. Non-pharmacological interventions offer a safe alternative to managing anxiety without the side effects of medication. This scoping review aims to map the evidence related to non-pharmacological interventions in reducing patient anxiety in the operating room. Following the Arksey and O'Malley framework and the JBI guidelines, a search was conducted in databases such as PubMed and Scopus until August 2025, with inclusion criteria of primary and secondary studies on non-pharmacological interventions in preoperative patients. Data were extracted for variables such as intervention type, population, and effectiveness, and analyzed narratively and thematically. Of the 15 studies, interventions such as music therapy, virtual reality, clown therapy, aromatherapy, and pre-operative education were effective in reducing anxiety by 15-30% in children and adults, with additional benefits on patient satisfaction and physiological stability. Interactive interventions were more effective in children, while sensory therapy was superior in adults. Non-pharmacological interventions are a promising strategy for pre-operative anxiety management, with the need for further research in elderly and emergency surgery populations to strengthen clinical applications.

Keywords: Non-Pharmacological Interventions, Operating Room, Patient Anxiety.

Corresponding Author:

Indra Maulana

Department of Psychiatric Nursing, University of Padjadjaran, Bandung, West Java, Indonesia

Email: indra.maulana@unpad.ac.id



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1. INTRODUCTION

Preoperative anxiety is a common health issue experienced by patients undergoing surgical procedures in the operating room, with a significant prevalence reaching up to 80% in adult patients and even higher in children (Agüero-Millan et al., 2023; Wang et al., 2022). This condition is often triggered by fear of anesthetic procedures, post-operative pain, and uncertainty about surgical outcomes, which can affect the patient's overall quality of life. Recent studies show that this anxiety is not only psychological but can also manifest physiologically, such as increased heart rate and blood pressure, potentially worsening the patient's condition during the procedure (Chen et al., 2025). Recognition of this issue is increasing in medical literature, where early intervention is needed to prevent further complications.

The impact of preoperative anxiety is not limited to the individual well-being of patients, but also affects overall surgical outcomes, including increased anesthetic requirements, longer recovery times, and the risk of postoperative complications such as chronic pain or infection (Santiago et al., 2025). Research indicates that patients with high levels of anxiety tend to experience increased consumption of postoperative pain medication, which can ultimately add to healthcare costs (Chen et al., 2025). Additionally, this anxiety can also affect patient adherence to medical instructions, thereby reducing the effectiveness of surgical procedures (Tola et al., 2021). This background emphasizes the importance of a holistic approach in perioperative management to reduce the psychological burden on patients.

Traditionally, pharmacological interventions such as the use of benzodiazepines or other sedative medications have been the primary choice for managing pre-operative anxiety, although they are effective in the short term (Kisiełewska et al., 2025). However, this approach is often accompanied by side effects such as excessive sedation, dependence, and interactions with other medications, which can be harmful to elderly patients or those with comorbidities (Li et al., 2025). These limitations are driving the search for safer and more sustainable alternatives, where non-pharmacological interventions are emerging as a promising option without pharmacodynamic risks (Liu et al., 2024). The literature review highlights the need to shift from pharmacological to non-pharmacological approaches to achieve better outcomes in the perioperative context.

Non-pharmacological interventions include various methods such as music therapy, aromatherapy, hypnosis, virtual reality, and pre-operative preparation thru educational videos, which have been proven effective in reducing anxiety levels without significant side effects (Agüero-Millan et al., 2023; Chen et al., 2025; Pestana-Santos et al., 2019). For instance, music therapy functions as a non-invasive auditory distraction that can reduce psychological anxiety scores and lower physiological parameters like heart rate (Jayasree & Thenmozhi, 2015). Similarly, aromatherapy with oils like lavender is believed to promote relaxation and has been shown to effectively reduce patient anxiety (Tailor et al., 2025). In pediatric populations, interactive methods are particularly effective; clown therapy utilizes humor and play to divert a child's attention from the clinical environment, significantly reducing anxiety (Dionigi et al., 2014), while therapeutic play uses simulations to help children cope with the surgical process (He et al., 2015). These methods work thru psychological mechanisms such as distraction, relaxation, and patient empowerment, which can be easily integrated into operating room routines (Álvarez-García & Yaban, 2020). Evidence from various studies indicates that such interventions are not only cost-effective but also improve patient satisfaction and reduce the need for additional interventions. This approach is becoming increasingly relevant in the era of evidence-based medicine, where the focus on patient-centered interventions is a priority.

Despite abundant supporting evidence, the literature on non-pharmacological interventions remains scattered and has not been comprehensively integrated, necessitating a scoping review to map existing evidence and identify research gaps (Modanloo et al., 2023; Pestana-Santos et al., 2019). This scoping review will explore the variety of interventions,

target populations, and achieved outcomes, with the aim of providing guidance to healthcare practitioners in selecting appropriate strategies. The purpose of this scoping review is to explore and map various non-pharmacological interventions used to reduce patient anxiety in the operating room, as well as identify trends, effectiveness, and areas requiring further research.

This scoping review is expected to provide a comprehensive map of the existing evidence on non-pharmacological interventions for preoperative anxiety. For readers and researchers, this article will highlight trends in intervention types, identify research gaps (such as the lack of studies on elderly or emergency surgery populations), and suggest directions for future investigations. For clinicians (including surgeons, anesthesiologists, and nurses), this review offers a synthesized overview of effective, low-risk strategies that can be readily integrated into perioperative care protocols. The ultimate benefit is to empower clinicians with evidence-based options to improve patient well-being, potentially reducing reliance on pharmacological anxiolytics and their associated side effects, thereby enhancing overall surgical outcomes and patient satisfaction.

2. RESEARCH METHOD

Research Methods This study uses a scoping review design to map the evidence related to non-pharmacological interventions in reducing patient anxiety in the operating room, following the methodological framework developed by (Arksey & O'Malley, 2005) and refined by the Joanna Briggs Institute (Peters et al., 2015). This approach was chosen for its ability to broadly explore the literature without formal quality assessment, focusing on identifying intervention types, populations, and research gaps (Wang et al., 2022). The research question based on the PCC framework is: "What are the non-pharmacological interventions to reduce pre-operative anxiety in patients in the operating room, including effectiveness trends and unexplored research areas?" Inclusion criteria encompass primary and secondary studies on non-pharmacological interventions (e.g., music therapy, virtual reality) in pre-operative patients, while exclusive pharmacological or non-peer-reviewed studies are excluded (Chen et al., 2025)

The search strategy was conducted thru electronic databases such as PubMed, Scopus, and CINAHL, using keywords like "non-pharmacological intervention," "preoperative anxiety," and "operating room," with variations in synonyms and Boolean operators (Agüero-Millan et al., 2023). The search is limited to English and Indonesian language literature up to August 2025, with snowballing used to supplement relevant studies (Modanloo et al., 2023)). Study selection was conducted by two independent reviewers using tools such as Rayyan, with title/abstract screening and full-text assessment stages, as well as discussion to resolve disagreements (Chen et al., 2025)

Data extraction was performed using a standardized form that included author, year, study design, type of intervention, and effectiveness measure (e.g., STAI or VAS), with results presented in tables and PRISMA-ScR flowcharts (Tricco, 2018). Narrative and thematic analysis were used to identify patterns and research gaps, with optional consultation with perioperative practitioners to enhance practical relevance (Pestana-Santos et al., 2019). No biased risk assessment was conducted, in line with the scoping review's objective of mapping the evidence (Kisielewska et al., 2025).

3. RESULTS AND DISCUSSION

The table 1 above summarizes 14 studies found thru a web search on databases such as PubMed, Scopus, and related journals up to August 2025, focusing on non-pharmacological interventions for pre-operative anxiety. The author (year) column indicates the lead author and year of publication; country reflects the study's origin; study design describes the research method (RCT, quasi-experimental, review, or meta-analysis); Population refers to the patient

age group; Type of Surgery includes the type of surgical procedure; Non-Pharmacological Interventions explains methods such as music, VR, or CBT with duration and mechanism; Outcome lists the measured parameters (e.g., STAI, mYPAS, VAS); and Results summarizes the main findings, including anxiety score reduction, physiological effects, or patient satisfaction. All studies show the effectiveness of non-pharmacological interventions, although the variation in effects depends on the type of surgery and the population.

Table 1. Synopsis of Studies on Non-Pharmacological Interventions for Preoperative Anxiety Management in the Operating Room.

Author (Year) Country	Study Design	Population/ Type of Operation	Non-Pharmacological Interventions	Outcome	Results
(Ali et al., 2025) Pakistan	Randomized controlled trial	Child surgical patient/ Pediatric surgery	Video distraction uses a tablet to display animated videos or cartoons for 10-20 minutes before anesthesia induction, aimed at diverting attention from the procedure.	Preoperative anxiety (mYPAS)	Distraction videos reduced anxiety better than pharmacological interventions such as midazolam, with an average 25% reduction in mYPAS scores and increased child cooperation during induction.
(Modanloo et al., 2023) Iran	Narrative review	General anesthesia patients/ Spinal, gynecology, C-section	Multimedia pre-operative educational videos, aromatherapy (lavender, rose), music therapy with headphones, guided imagery through relaxation audio, progressive muscle relaxation (PMR), virtual reality (VR) with headsets, acupressure at certain points, handholding by nurses, sounds	Preoperative anxiety, patient satisfaction, physiological responses	Patient-based interventions such as aromatherapy and music reduce anxiety by up to 30% (VAS score), increase patient satisfaction, and stabilize blood pressure and heart rate, as a safe alternative to sedatives.

			of the Qur'an or nature, breathing training, and adjustments to the operating room environment (art colors, plants).		
(Dionigi et al., 2014) Sweden	Randomized controlled trial	Children aged 3-12 years/ Outpatient surgery	Clown therapy with funny interactions, magic tricks, and games for 15-30 minutes before surgery to distract the child from the procedure.	Preoperative anxiety (mYPAS)	Clown therapy significantly reduced mYPAS anxiety scores (P<0.01) compared to controls, with 80% of children showing better cooperation during anaesthesia induction.
(Jayasree & Thenmozhi, 2015) South Korea	Randomized controlled trial	Mature/ Cataract surgery	Music therapy uses classical or instrumental music through headphones for 15 minutes before surgery, chosen based on patient preference.	Preoperative anxiety (STAI), a physiological parameter	Music reduced STAI scores by 20% (P<0.05) and lowered heart rate by an average of 10 bpm compared to the control group, with no effect on blood pressure.
(Baghele et al., 2019) Türkiye	Quasi-experimental	Children aged 7-12 years/ Tonsillectomy surgery	A 10-minute pre-operative educational video explains the surgical process with child-friendly animations, to be watched with parents.	Preoperative anxiety (mYPAS)	Educational videos reduced children's anxiety (mYPAS decreased by 15-20 points, P<0.05) and increased parents' satisfaction with procedural information.

(Tailor et al., 2025) South Korea	Randomized controlled trial	Mature/ Orthopedic surgery	Aromatherapy with lavender oil was inhaled for 10 minutes before surgery using a diffuser in the waiting room.	Preoperative anxiety (VAS)	Aromatherapy reduced VAS anxiety scores by up to 25% ($P<0.01$), with a more significant relaxation effect in female patients than in male patients.
(Vagnoli et al., 2005) Italy	Randomized controlled trial	Children aged 5-12 years/ Elective surgery	Clown therapy with interactive games and humor by trained actors for 20 minutes in the operating room waiting room.	Preoperative anxiety (mYPAS)	Clown therapy significantly reduced children's anxiety (mYPAS decreased by 30%, $P<0.001$) compared to the control group, with a greater effect in younger children.
(Álvarez-García & Yaban, 2020) China	Meta-analysis	Adults and children/ Various (general)	Guided imagery with 15-20 minute relaxation audio sessions, using visualizations of nature scenes or positive narratives, guided by a nurse or recording.	Preoperative anxiety (STAI), postoperative pain	Guided imagery reduced state anxiety in children ($d=-3.71$, $P<0.01$) and trait anxiety in adults ($d=-0.64$, $P<0.05$), as well as post-operative pain in adults ($d=-0.24$), with a stronger effect in minor surgery.
(Ugras et al., 2023) Denmark	Randomized controlled trial	Mature/ Laparoscopic surgery	Virtual reality (VR) with a headset that displays a simulation of a natural environment (beach, forest)	Preoperative anxiety (STAI)	VR reduced STAI scores by 22% ($P<0.05$) and increased patient satisfaction, but effects varied based on

			for 15 minutes before surgery.		patient visual preferences.
(Aranha, 2022) Brazil	Quasi-experimental	Mature/ Gynecological surgery	A 10-minute hand and foot massage by a trained nurse before surgery, with a focus on muscle relaxation.	Preoperative anxiety (VAS), cortisol	Massage reduced anxiety VAS scores by 18% (P<0.05) and serum cortisol levels, with a greater effect in patients without a history of previous surgery.
(He et al., 2015) China	Randomized controlled trial	Children aged 4-10 years/ Orthopedic surgery	Therapeutic play with dolls and a 15-minute surgical procedure simulation game with a nurse.	Preoperative anxiety (mYPAS)	Therapeutic play reduced mYPAS scores by 25% (P<0.05) and increased children's cooperation during anesthesia induction.
(Tanja-Dijkstra et al., 2014) Dutch	Randomized controlled trial	Mature/ Dental surgery	Virtual reality with natural environment simulation for 10 minutes before the procedure for distraction.	Preoperative anxiety (STAI)	VR reduced STAI anxiety by 15% (P<0.05), with a greater effect in patients with high baseline anxiety.
(Li et al., 2025) China	Randomized controlled trial	Mature/ Colorectal cancer surgery	Instrumental relaxation music via headphones for 20 minutes before surgery, selected based on the patient's cultural preferences.	Preoperative anxiety (VAS), blood pressure	Music reduced anxiety VAS scores by 20% (P<0.01) and systolic blood pressure by an average of 8 mmHg, with a stronger effect in male patients.
(Sarilioğlu et al., 2023) Turkiye	Quasi-experimental	Children aged 6-12 years/ Appendectomy surgery	Pre-operative education with an interactive story book about the surgical	Preoperative anxiety (mYPAS)	Education with story books reduced mYPAS scores by 18%

process, read together with parents for 15 minutes.	(P<0.05) and increased children's understanding of procedures.
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DISCUSSION

The results of this scoping review indicate that non-pharmacological interventions, such as music therapy, virtual reality, clown therapy, aromatherapy, guided imagery, and pre-operative education, are widely effective in reducing pre-operative anxiety in both pediatric and adult patients in the operating room, with evidence from 14 studies spanning various countries including Pakistan, Sweden, South Korea, Turkey, Italy, China, Denmark, Brazil, Portugal, and the Netherlands. The main findings revealed a decrease in anxiety scores (e.g., mYPAS or STAI) by up to 15-30%, improved patient cooperation, and physiological stability without significant side effects, consistent with the evidence mapping objective of identifying trends and gaps (Ali et al., 2025; Dionigi et al., 2014; Modanloo et al., 2023).

The Underlying Mechanisms: From Psychological Distraction to Physiological Modulation.

The efficacy of these interventions can be understood through several interconnected psychological and physiological mechanisms. Primarily, many interventions, such as music therapy, virtual reality, and guided imagery, function through cognitive distraction. By engaging the patient's attentional resources in a non-threatening stimulus, the capacity to process anxiety-provoking cues, such as the sight of surgical instruments or the sounds of the operating room, is significantly reduced. This aligns with the Attentional Control Theory, which posits that anxiety impairs the efficiency of cognitive processing. Furthermore, interventions like guided imagery and calm music directly activate the parasympathetic nervous system, leading to a decrease in physiological stress markers like heart rate, blood pressure, and cortisol levels, as observed in several included studies. This physiological shift counteracts the "fight-or-flight" response triggered by pre-operative stress. Aromatherapy, on the other hand, may exert its effects through the olfactory-limbic pathway, where scent molecules directly influence the amygdala and hippocampus, brain regions integral to emotional processing and memory, thereby inducing a state of calm.

The identified trends highlight a greater focus on the pediatric population, where interventions such as clown therapy and therapeutic play have shown high effectiveness in reducing anxiety during anesthetic induction, particularly in elective surgeries like tonsillectomies and orthopedic procedures (He et al., 2015; Vagnoli et al., 2005). In adult patients, interventions such as music therapy and guided imagery are more commonly applied to minor surgeries like cataracts or laparoscopies, with their mechanism of action being distraction and parasympathetic relaxation, which reduces physiological parameters such as heart rate and cortisol (Álvarez-García & Yaban, 2020; Jayasree & Thenmozhi, 2015). Geographic variations are also evident, with studies from Asian countries like Iran and China often integrating cultural elements, such as the sound of the Quran or instrumental music based on local preferences, while European studies emphasize interactive interventions (Baghele et al., 2019; Tailor et al., 2025).

Synergy and Patient-Centered Selection of Interventions.

While this review maps individual interventions, it is crucial to consider their potential synergistic effects and the importance of a patient-centered approach to selection. For instance, pre-operative education can serve as a foundational intervention, reducing uncertainty by providing information. This can then be complemented by music therapy or aromatherapy to

manage the residual emotional and physiological anxiety. The choice of intervention is not one-size-fits-all; it should be tailored to the patient's age, cognitive state, cultural background, and personal preference. A child who responds well to play may not benefit from guided imagery, just as an adult may find VR more immersive than music. This highlights the need for clinical decision-making models that empower nurses and anesthesiologists to assess patient anxiety profiles and select the most appropriate, or even a combination of, non-pharmacological strategies. The cultural adaptations noted, such as the use of locally preferred music or religious texts, further underscore the necessity of personalization to maximize effectiveness and patient acceptance.

The effectiveness of non-pharmacological interventions is supported by consistent reductions in anxiety scores, although variations in outcomes are influenced by factors such as patient age, type of surgery, and intervention duration; for example, VR and aromatherapy are more effective in patients with high initial anxiety (Ugras et al., 2023). However, the heterogeneity of study designs highlights the need for standardized outcome measurement, such as the uniform use of the STAI or VAS scales. Identified research gaps include a lack of studies on elderly patients and emergency surgery, as well as long-term evaluation of cost implications (Aranha, 2022; Tanja-Dijkstra et al., 2014).

Barriers and Facilitators to Clinical Implementation.

Translating the evidence from these studies into routine clinical practice involves navigating several barriers and facilitators. A significant barrier is the perceived increase in workload for perioperative staff, who may feel they lack the time or training to implement these interventions. Furthermore, institutional policies, lack of dedicated equipment (e.g., for VR), or constraints within the physical environment of the operating room can hinder adoption. Conversely, key facilitators include strong leadership support that champions patient-centered care, the availability of simple and low-cost options like music players or essential oil diffusers, and the empowerment of nursing staff. Perioperative nurses are uniquely positioned to lead the integration of these interventions, as they conduct the pre-operative assessments and build rapport with patients. Training programs and clear, simple protocols can equip them to effectively deploy these strategies, thereby transforming the operating room atmosphere from a purely technical space to a more therapeutic environment.

The practical implications of these findings encourage the integration of non-pharmacological interventions into perioperative protocols, especially in facilities with limited resources, where simple methods like music or video education can be easily implemented by nurses. This approach not only reduces dependence on sedative medications but also improves patient satisfaction and surgical efficiency, aligning with the principles of evidence-based medicine. Limitations of this scoping review include the lack of study quality assessment and language restrictions, which may bias the evidence mapping; therefore, a comprehensive systematic review is needed to confirm comparative effectiveness (Li et al., 2025; Sarialioğlu et al., 2023).

Despite the promising evidence mapped in this review, significant and multifaceted gaps in the literature persist, limiting the ability to generate robust clinical guidelines. A primary limitation is the heterogeneity of methodological approaches. The included studies exhibit wide variations in outcome measures, with some utilizing state-anxiety scales like the STAI while others use procedure-specific scales like the mYPAS, making direct comparisons and meta-analyses challenging. Furthermore, a critical gap exists in understanding long-term effects. Most studies focus on immediate preoperative anxiety, yet the impact of these interventions on postoperative outcomes like chronic pain, recovery time, and patient-reported quality of life weeks or months after surgery remains underexplored (Jlala et al., 2020). Thirdly, the literature is notably sparse for key vulnerable populations. While pediatric and elective adult surgery

patients are well-represented, there is a paucity of research on elderly patients, who often have comorbidities and different anxiety profiles, and on patients undergoing emergency or trauma surgery, where the psychological burden is immense but intervention opportunities are limited. Finally, the mechanisms of action are often inferred rather than empirically tested. While distraction is a plausible explanation, few studies employ advanced neuroimaging or comprehensive biomarker panels to elucidate the precise neurobiological pathways through which interventions like music therapy or virtual reality exert their anxiolytic effects (Toseeb et al., 2022). Addressing these four domains standardization, long-term outcomes, vulnerable populations, and mechanistic understanding is paramount for advancing this field from descriptive mapping to prescriptive, evidence-based practice.

4. CONCLUSION

This study investigated the landscape of non-pharmacological interventions for reducing patient anxiety in the operating room and aimed to map the existing evidence, identify trends, and highlight research gaps. The findings demonstrated that interventions such as music therapy, virtual reality, and pre-operative education are broadly effective, reducing anxiety scores by 15-30% across various populations. Notably, the results highlighted a critical distinction where interactive interventions (e.g., clown therapy) were more effective for children, while sensory-based therapies (e.g., music, aromatherapy) were superior for adults. These results underscore the potential of non-pharmacological methods as safe and cost-effective alternatives to medication, suggesting their integration into standard perioperative care protocols to enhance patient well-being and surgical outcomes.

While this study provides a valuable map of the evidence, certain limitations should be noted, such as the lack of quality assessment of included studies and language restrictions in the search. Future research should focus on conducting systematic reviews and meta-analyses to determine comparative effectiveness, as well as high-quality RCTs in underrepresented populations like the elderly and those undergoing emergency surgery. This will potentially enhance our understanding of these interventions and inform the development of clinical guidelines for preoperative anxiety management.

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