



Addressing Occupational Stress in Emergency and Critical Care Nurses: A Systematic Review of Aromatherapy and Music Therapy

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Abstract. Emergency and critical care nurses frequently face stressful work environments, emotional strain, and demanding clinical duties, leading to high occupational stress levels and increased anxiety and burnout in this population. Non-pharmacological interventions like music therapy and aromatherapy have gained attention as means of promoting the psychological well-being of health practitioners. This systematic review will synthesize the evidence on the efficacy of music therapy, aromatherapy, and complementary interventions in reducing occupational stress and related psychological outcomes among emergency and critical care nurses. A systematic review of the literature will be conducted according to the PRISMA 2020 guidelines. A search of 5 electronic databases will be carried out for peer-reviewed papers published from January 2019 to December 2025. The eligible studies include quantitative articles studying the effect of music therapy, aromatherapy, and combined interventions among emergency and critical care nurses. Data will be extracted and synthesized narratively. In total, 15 articles meet the inclusion criteria: four randomized controlled trials, three quasi-experimental studies, two placebo-controlled trials, and six observational studies. Majority of the studies showed positive changes in occupational stress, anxiety, and burnout following aromatherapy-based and music interventions.

Keywords: Aromatherapy, Music Therapy, Occupational Stress, Burnout, Emergency Nurses, Critical Care Nurses.

1 Introduction

Occupational stress remains a major concern in the nursing profession, particularly among those providing care in emergency departments and critical care units [1], [2], [3]. These clinical settings require nurses to manage critically ill patients, respond rapidly to changing conditions, make time-sensitive decisions, and cope with emotionally demanding situations, all of which increase psychological strain [4], [5], [6]. Long-term exposure to these stressors results in burnout, emotional exhaustion, compassion fatigue, and job dissatisfaction for the nurse; this not only affects them personally but also the standard of patient care they provide [7], [8], [9].

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Among healthcare professionals, emergency and critical care nurses are especially susceptible to work-related psychological stress because they practice in highly complex, fast-paced, and unpredictable environments. The literature provides proof that the levels of stress and burnout experienced by nurses in emergency departments and intensive care units are high. This is because of the adverse effects of such conditions on the nursing workforce, which include intention to leave, increased absenteeism, and lack of sustainability. [10], [11], [12].

Non-pharmacological interventions have gained attention as practical approaches to support nurses' psychological well-being [13], [14], [15], [16]. Among these interventions, music therapy and aromatherapy have been found effective in decreasing stress levels, providing relaxation and enhancing emotional wellbeing [17], [18], [19]. Both interventions are relatively inexpensive, easy to implement, and may be integrated into workplace wellness initiatives [20], [21].

Despite the growing adoption of music therapy and aromatherapy as non-pharmacological approaches to promote psychological well-being among healthcare professionals, the available evidence regarding their effectiveness remains inconsistent and fragmented. In addition, there have been few research studies conducted that have looked at the efficacy of music therapy and aromatherapy individually or combined in the management of stress in emergency and critical care nurses.

Accordingly, this review was performed in order to provide a critical synthesis of the current literature on the effectiveness of music therapy, aromatherapy, and music-aromatherapy treatment for the reduction of occupational stress and improvement of psychological well-being among nurses in emergency and critical care units.

2 Methods

2.1 Study design

To ensure a structured review process, this study applied the PRISMA 2020 reporting framework. The review was undertaken without prior protocol registration in PROSPERO or another international systematic review registry. The objective was to summarize and integrate current evidence on the use of aromatherapy, music therapy, and combined music–aromatherapy interventions for managing occupational stress and supporting the psychological well-being of nurses working in emergency and critical care environments.

2.2 Eligibility Criteria

Criteria for including articles in this study were as follows: (1) those that involved registered nurses working in emergency units, intensive care units, and/or any other critical care settings; (2) those that involved the effects of music therapy, music interventions, aromatherapy using essential oils, and/or both music therapy and aromatherapy; (3) those that focused on occupational stress or other psychological factors, like burnout, emotional exhaustion, compassion fatigue, anxiety, psychological distress, and/or psy-

chological well-being; (4) those that had a quantitative research design, such as a randomized controlled trial design or a pre-and-post-intervention study design; (5) those that had been published in peer-reviewed journals; (6) those that had been published in English; and (7) those that had been published from January 2019 to December 2025. Studies were excluded if they involved healthcare professionals other than nurses, used qualitative research designs, or were published as review articles, conference abstracts, editorials, commentaries, letters to the editor, or study protocols. Publications released before January 2019 were also excluded from the review.

2.3 Sources and Search Strategy

Relevant studies were identified through searches of PubMed, Scopus, Web of Science, CINAHL, and ScienceDirect. The search strategy incorporated both controlled indexing terms and free-text keywords representing the target population, clinical setting, interventions, and outcomes, including nurses, emergency and critical care, music therapy, aromatherapy, occupational stress, burnout, and psychological well-being. Boolean operators (AND/OR) were used to combine search terms and improve the sensitivity and specificity of the search. Eligibility was restricted to English-language, and articles published in peer-reviewed journals from January 2019 through December 2025.

For instance, one strategy to conduct the search was as follows:

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("nurse*" OR "critical care nurse*" OR "intensive care nurse*" OR "emergency nurse*")  
AND  
("music therapy" OR "music intervention" OR "music listening" OR "essential oil*" OR "aromatherapy" OR "lavender aromatherapy" OR "combined intervention")  
AND  
("occupational stress" OR "work-related stress" OR "burnout" OR "emotional exhaustion" OR "compassion fatigue" OR "psychological distress" OR "well-being").
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2.4 Study Selection

All the references retrieved from the database search process were uploaded into reference management software, where duplicates were identified and deleted. Once the duplicates were eliminated, two reviewers independently screened the titles and abstracts of all studies based on the predetermined criteria. Studies which were potentially relevant were downloaded and further assessed for eligibility. Any dispute that occurred in the process of screening and eligibility assessment was resolved via discussion.

2.5 Data Extraction

To ensure consistency and minimize errors, two reviewers independently retrieved the required data from all eligible studies using a predesigned standardized extraction form. A standardized extraction process was used to obtain information on the first author,

publication year, study location, research design, participant characteristics, study setting, intervention details and duration, comparator or control group, outcome measures, and the principal findings of each included study.

2.6 Quality Assessment

Methodological quality was evaluated using JBI critical appraisal tools tailored to randomized controlled, quasi-experimental, and observational study designs. Due to the fact that the unique smell of the essential oils makes blinding impossible in inhalation therapy, double-blinded studies were critically analyzed. This problem was considered when evaluating the quality of studies as it can cause performance bias. Any discrepancies between the two reviewers were discussed until the agreement was reached. The quality assessment was carried out to evaluate the methodological quality of the selected studies.

2.7 Data Synthesis

The findings were synthesized narratively by comparing study characteristics, intervention protocols, outcome measures, and reported results across the included studies. To facilitate interpretation, studies were categorized according to the intervention evaluated, namely music therapy, aromatherapy, or combined music–aromatherapy interventions. The extracted evidence was synthesized to evaluate the effectiveness of each intervention in addressing occupational stress and other psychological outcomes among emergency and critical care nurses. Furthermore, it was checked if there is an opportunity to conduct a meta-analysis, depending on the presence of comparability among included studies.

3 Results

The database search yielded 3,940 records, comprising 3,327 articles identified through electronic databases (PubMed, $n = 722$; Scopus, $n = 45$; Web of Science, $n = 457$; CINAHL, $n = 277$; and ScienceDirect, $n = 826$) and an additional 613 records from other sources. After removing 510 duplicate records, 3,430 unique articles proceeded to title and abstract screening. During this stage, 3,385 records were excluded for not meeting the predefined eligibility criteria, resulting in 45 articles undergoing full-text review. Following full-text assessment, 30 studies were excluded because they did not fulfill the inclusion criteria. Consequently, 15 studies satisfied all eligibility requirements and were included in the final systematic review. The complete study selection process is illustrated in the PRISMA flow diagram (Figure 1).

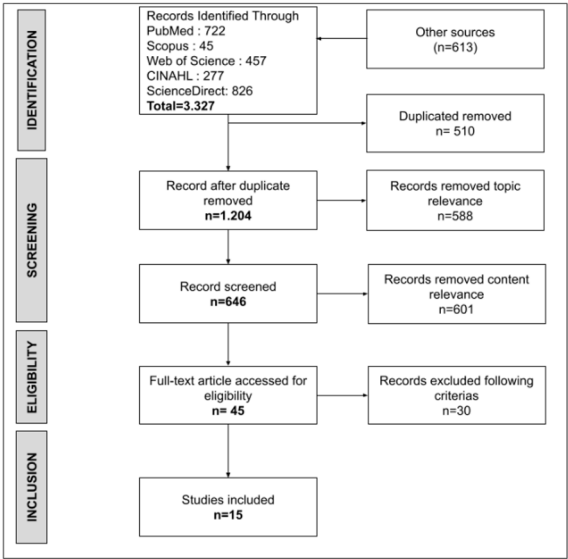


Figure 1. PRISMA 2020 Flow Diagram of the Literature Search and Study Selection Process

The study selection process resulted in the inclusion of 15 studies that met all predefined eligibility criteria for this systematic review (Table 1). Selection process focused on studies involving the use of aromatherapy, music therapy, and other similar complementary mind-body approaches to alleviate occupational stress among emergency and critical care nurses.

Table 1. Included Studies on Music Therapy and Aromatherapy for Occupational Stress in Critical Care Nursing Settings

Author (Year)	Country	Population/ Setting	Sample	Study Design	Intervention	Outcome(s)	Main Findings
Safitri et al. (2022)[22]	Indonesia	Emergency room nurses in a regional public hospital	70 nurses	Quasi-experimental (one-group pretest-posttest)	Lemon aromatherapy cream	Burnout (MBI-HSS)	Significantly reduced burnout levels ($p = 0.019$).
Karimi et al. (2024)[23]	Iran	ICU nurses caring for COVID-19 patients	84 nurses	Double-blind RCT	Pelargonium graveolens inhalation aromatherapy	Fatigue, sleep quality	Reduced fatigue ($p < 0.05$); no significant effect on sleep quality.
Lee et al. (2023)[24]	South Korea	Nurses in COVID-19 ICU	57 nurses	Double-blind RCT	Marjoram essential oil inhalation	Stress, anxiety, MAP, heart rate	Reduced stress and anxiety ($p \leq 0.037$); no significant physiological changes.
Hung et al. (2023)[25]	Taiwan	Hospital nursing staff	80 nurses	Quasi-experimental	Bergamot inhalation aromatherapy	Work stress, burnout	Reduced stress and burnout compared

Author (Year)	Country	Population/ Setting during COVID-19	Sample	Study Design	Intervention	Outcome(s)	Main Findings
Emadikhalaf et al. (2023)[26]	Iran	Hospital nurses	118 nurses	Randomized placebo-controlled trial	Lavender or rose inhalation	Job stress	with baseline/control. Rose significantly reduced job stress ($p = 0.002$); lavender not significant at week 2.
Hsu et al. (2021)[27]	Taiwan	Critical care nurses	80 nurses	RCT	Aromatherapy massage (lavender oil)	Sleep quality, ANS activity	Improved sleep quality and parasympathetic activity.
Ghods et al. (2022)[28]	Iran	Pre-hospital emergency staff	167 participants	Randomized placebo-controlled trial	Citrus aurantium inhalation	Happiness	No significant effect vs placebo.
Hubbard et al. (2024)[29]	USA	ICU and NICU nurses	Not specified clearly	Randomized blinded placebo-controlled trial	Essential oil blend	Anxiety	No significant difference vs placebo.
Zamanifar et al. (2020)[30]	Iran	Hospital nurses	120 nurses	RCT (4 arms)	Music, aromatherapy, combination	Anxiety	All interventions reduced anxiety vs control; combined most effective.
Tran et al. (2025)[31]	USA	ICU nurses	~81% eligible nurses	QI pre-post design	Mindfulness + clinical aromatherapy	Stress, well-being	Reduced stress (-9.36%) and improved well-being ($+10.98\%$).
Yang et al. (2025)[32]	Taiwan	Female hospital nurses	60 nurses	Quasi-experimental repeated measures	Lavender vs lavender + music therapy	Stress, anxiety, depression, vitals	Both improved outcomes; combined therapy showed stronger sustained effects.
Niva W.J et al. (2020)[33]	India	Nursing professionals in a tertiary care hospital	30 (15 intervention, 15 control)	Randomized Controlled Trial	Mahamantra chanting (20 min/day for 45 days)	Stress level (cortisol, salivary amylase)	Significant reduction in cortisol and salivary amylase in the intervention group compared to control
Calamassi et al. (2021)[34]	Italy	Emergency nurses	100+ nurses (exact sample varies per analysis)	Cross-sectional/survey study	Exposure to aromatherapy in workplace (essential oil diffusion)	Stress, anxiety, job satisfaction	Aromatherapy exposure associated with lower perceived stress and anxiety, and improved well-being among nurses
Kim et al. (2024) [35]	South Korea	ICU nurses	29	Prospective pre-post	Online Supportive Music and Imagery (5 weeks)	Stress, distress, sleep	Reduced Stress and distress; no sleep improvement
Ozgundondur & Gok Metin (2019) [36]	Turkey	ICU nurses	56 ICU nurses	RCT	Progressive Muscle Relaxation and music (8 weeks)	Stress, fatigue, coping	Reduced Stress and fatigue; increased coping styles

Studies selected for the review included RCTs, randomized placebo-controlled studies, quasi-experimental designs, a pre-post quality improvement study, and a cross-sectional study. The included studies represented diverse geographical settings, with research conducted in Indonesia, Iran, Taiwan, South Korea, the United States, Italy, and India.

Methodological quality assessment using the Joanna Briggs Institute (JBI) Critical Appraisal Tools showed that 12 of the 15 included studies were rated as high quality, two studies were rated as moderate quality, and one study was rated as moderate-to-high quality. Randomized controlled trials generally demonstrated higher methodological rigor than quasi-experimental studies. A summary of the quality assessment is presented in Table 2.

Table 2. Critical Appraisal of Included Studies

Author (Year)	Study Design	JBI Tool	Quality Rating
Safitri et al. (2022)	Quasi-experimental	JBI Quasi-Experimental (9 items)	Moderate
Karimi et al. (2024)	Double-blind RCT	JBI RCT (13 items)	High
Lee et al. (2023)	Double-blind RCT	JBI RCT (13 items)	High
Hung et al. (2023)	Quasi-experimental	JBI Quasi-Experimental (9 items)	High
Emadikhalaf et al. (2023)	Placebo-controlled RCT	JBI RCT (13 items)	High
Hsu et al. (2021)	RCT	JBI RCT (13 items)	High
Ghods et al. (2022)	Placebo-controlled RCT	JBI RCT (13 items)	High
Hubbard et al. (2024)	Blinded placebo-controlled RCT	JBI RCT (13 items)	High
Zamanifar et al. (2020)	RCT (4 arms)	JBI RCT (13 items)	High
Tran et al. (2025)	QI pre-post design	JBI Quasi-Experimental (9 items)	Moderate
Yang et al. (2025)	Quasi-experimental repeated measures	JBI Quasi-Experimental (9 items)	High
Niva W.J. et al. (2020)	RCT	JBI RCT (13 items)	Moderate–High
Calamassi et al. (2021)	Double-blind, randomized controlled pilot study	JBI RCT (13 items)	High
Kim et al. (2024) [35]	Preliminary prospective one-group pre–post intervention study	JBI Quasi-Experimental (9 items)	High
Ozgundondu & Gok Metin (2019) [36]	RCT	JBI RCT (13 items)	High

3.1 Study Characteristic

The total population consisted of hospital nurses working in high-stress environments, including emergency departments, intensive care units (ICU), neonatal ICU (NICU), COVID-19 wards, and pre-hospital emergency services. Sample sizes ranged from 30 to 167 participants.

The interventions were categorized into three main groups: Aromatherapy-based interventions (inhalation, massage, diffusion using lavender, rose, bergamot, marjoram, pelargonium, citrus aurantium, lemon, and blended essential oils); Music therapy-based interventions (alone or combined with aromatherapy); Other complementary mind-body interventions, including mindfulness-based care and chanting interventions used either alone or in combination with aromatherapy.

Outcome measures primarily focused on occupational stress, burnout, anxiety, fatigue, sleep quality, physiological parameters (heart rate, MAP, autonomic nervous system activity), and psychological well-being.

3.2 Synthesis of Findings

Occupational Stress, Anxiety, and Burnout. Most studies found decreased levels of occupational stress, anxiety, and burnout after aromatherapy and complementary therapy sessions. Significant findings have been identified in the studies conducted by Safitri et al. (2022) and Hung et al. (2023); whereas, RCTs carried out by Lee et al. (2023) and Emadikhalaf et al. (2023) have revealed decreased levels of stress and anxiety. Combinations of interventions such as music therapy, aromatherapy, and mindfulness (Zamanifar et al., 2020; Yang et al., 2025; Tran et al., 2025) had greater impacts. Nevertheless, Hubbard et al. (2024) did not find significant.

Burnout and Work-Related Distress. Burnout reduction was reported in Safitri et al. (2022) and Hung et al. (2023). Workplace aromatherapy exposure in Calamassi et al. (2021) was associated with lower stress and improved well-being.

Fatigue, Sleep Quality, and Physiological Outcomes. Fatigue decreased in Karimi et al. (2024), while sleep quality improved in Hsu et al. (2021). No significant physiological changes were reported in Lee et al. (2023).

Combined Interventions. Stronger effects were observed in combined interventions such as music therapy with aromatherapy (Zamanifar et al., 2020; Yang et al., 2025) and mindfulness-based aromatherapy (Tran et al., 2025).

Non-significant Findings. No significant effects were reported in Ghods et al. (2022) and Hubbard et al. (2024).

3.3 Critical Appraisal

The methodological quality of the selected papers was evaluated by employing the tools for critical appraisal prepared by Joanna Briggs Institute (JBI). The selected articles displayed good to very good methodological quality overall. The randomized control trials met all of the JBI criteria with the exception of the presence of random allocation, comparison group, and accurate outcome measures. The quasi-experiments had good

methodological quality; however, the absence of random allocation and sometimes comparison groups hindered their results. The cross-sectional research met most of the appraisal criteria; nevertheless, owing to its nature, no causal conclusions could be made.

4 Discussion

The systematic review assessed the effectiveness of aromatherapy, music therapy, and combined mind-body techniques on reducing work-related stress of emergency and critical care nurses. According to this analysis, there is some evidence about the beneficial effect of the interventions on the psychological state of the population, mainly, on stress, anxiety, exhaustion, and burnout. The most pronounced benefits were observed with interventions involving aromatherapy, particularly when combined with music therapy or mindfulness-based approaches.

The positive effect of the intervention involving aromatherapy revealed in this review coincides with the previous studies proving the effectiveness of non-medication techniques of dealing with occupational stress among healthcare providers. Zhang et al. (2021) found that stress-relaxation interventions helped to reduce stress at work among healthcare professionals. This effect can be achieved by stimulating the limbic system responsible for regulating emotional responses through the sense of smell [37], [38]. Essential oils such as lavender, rose, bergamot, marjoram, and lemon have proved their efficacy in this case.

The beneficial effects of music on psychological outcomes may be explained by its ability to modulate the autonomic nervous system and attenuate the physiological stress response [39], [40]. Listening to calming or preferred music has been shown to reduce sympathetic nervous system activity while enhancing parasympathetic activity, leading to lower anxiety, improved emotional regulation, and decreased secretion of stress hormones such as cortisol [41]. Music also serves as a cognitive distraction, redirecting attention away from stressful stimuli and promoting relaxation through positive emotional processing [42]. These mechanisms collectively contribute to reductions in stress, anxiety, and burnout among healthcare professionals, although the magnitude of benefit may vary according to music type, duration, and individual preferences [43], [44]. These mechanisms are consistent with the findings of the present review, in which music-based interventions, either alone or combined with other relaxation techniques, consistently improved psychological outcomes among nurses, particularly stress, anxiety, and burnout.

A notable finding was the greater effectiveness of combined interventions compared with single-modality approaches. Studies integrating aromatherapy with music therapy or mindfulness demonstrated more sustained improvements in stress and anxiety outcomes [45], [46]. These findings are supported by previous reviews indicating that music-based interventions can improve emotional well-being and reduce burnout symptoms among nurses [47], while mindfulness interventions have been shown to decrease stress and burnout in nursing populations [48]. Together, these findings suggest that

addressing occupational stress through multiple sensory and cognitive pathways may enhance intervention effectiveness [49], [50].

Despite the generally positive findings, the evidence remains heterogeneous. Several studies reported non-significant outcomes, particularly for physiological measures and placebo-controlled comparisons. Variations in intervention protocols, essential oil composition, duration of exposure, and outcome assessment tools may have contributed to these inconsistencies. Furthermore, psychological outcomes appeared to improve more consistently than physiological indicators, suggesting that these interventions may primarily influence perceived stress and emotional well-being.

The present systematic review adds value to the existing literature through the inclusion of specific research on emergency and critical care nurses, a highly vulnerable population due to the stressful conditions under which they operate. However, there are several limitations to be noted. Since the present systematic review was conducted using only peer-reviewed articles in English, the search for gray literature and registered clinical trials could result in potential risk factors for language bias and publication bias. Despite the encouraging findings, the evidence remains limited by the methodological diversity of the included studies, relatively small sample sizes, and short follow-up durations. Future research should emphasize adequately powered, multicenter randomized controlled trials with standardized protocols and longer-term follow-up.

5 Conclusion

Overall, the findings suggest that aromatherapy and other complementary mind–body interventions, particularly when combined with music therapy or mindfulness-based techniques, may provide effective non-pharmacological strategies for reducing occupational stress, anxiety, and burnout among emergency and critical care nurses. The available evidence indicates that multimodal interventions may provide more consistent improvements than single-modality approaches; however, these findings should be interpreted with caution because of the limited number of studies, methodological heterogeneity, and variation in intervention protocols. Given their relatively low cost, non-invasive nature, and feasibility for implementation, these interventions may represent promising components of workplace well-being programs in high-stress healthcare settings. Although the current findings are promising, the evidence remains limited. Future research should focus on adequately powered randomized controlled trials incorporating standardized intervention protocols and longer follow-up periods to confirm effectiveness and examine the long-term sustainability of intervention outcomes.

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