

EFFECTIVENESS OF NON-PHARMACOLOGICAL INTERVENTIONS IN REDUCING PAIN DURING WOUND CARE: A SYSTEMATIC REVIEW

ÚČINNOSŤ NEFARMAKOLOGICKÝCH INTERVENCIÍ PRI ZNIŽOVANÍ BOLESTI POČAS OŠETROVANIA RÁN: SYSTEMATICKÝ PREHLAD

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ABSTRACT

Theoretical background: Procedural pain during wound care remains a significant clinical issue affecting patient comfort, psychological well-being, and quality of care. Although pharmacological approaches are widely used, their limitations have led to increasing interest in non-pharmacological interventions as complementary strategies.

Objectives: This study aimed to systematically evaluate the effectiveness of non-pharmacological interventions in reducing procedural pain and anxiety during wound care in pediatric and adult populations.

Research sample and method: A systematic review was conducted following PRISMA 2020 guidelines. Literature searches were performed in Scopus, PubMed/MEDLINE, ScienceDirect, EBSCO (CINAHL), ClinicalTrials.gov, and Taylor & Francis Online for studies published between 2015 and 2025. Randomized controlled trials and quasi-experimental studies were included. A total of 10 studies met the inclusion criteria. Methodological quality was assessed using the Joanna Briggs Institute Critical Appraisal Tool, and findings were synthesized narratively.

Results: Most studies demonstrated that non-pharmacological interventions effectively reduced procedural pain and anxiety. Sensory and psychological approaches, including virtual reality, music therapy, guided imagery, and aromatherapy, showed more consistent and robust effects compared to physical interventions such as massage and cold application. Greater effectiveness was observed in pediatric populations and in interventions applied repeatedly and aligned with procedural timing.

Conclusions: Non-pharmacological interventions are effective and feasible adjuncts in wound care pain management. Their integration into clinical practice may enhance patient-centered care. Further high-quality and standardized research is needed to strengthen the evidence base.

Key words: Procedural pain. Wound care. Non-pharmacological interventions. Pain management. Nursing practice.

ABSTRAKT

Teoretické východiská: Procedurálna bolesť pri ošetrovaní rán predstavuje významný klinický problém ovplyvňujúci komfort pacienta, psychickú pohodu a kvalitu starostlivosti. Napriek širokému využívaniu farmakologických prístupov ich obmedzenia zvyšujú záujem o nefarmakologické intervencie ako doplnkové stratégie.

Ciele: Cieľom štúdie bolo systematicky zhodnotiť účinnosť nefarmakologických intervencií pri znižovaní procedurálnej bolesti a úzkosti počas ošetrovania rán u detských a dospelých pacientov.

Výskumná vzorka a metodika: Systematický prehľad bol realizovaný podľa smerníc PRISMA 2020. Vyhľadávanie prebehlo v databázach Scopus, PubMed/MEDLINE, ScienceDirect, EBSCO (CINAHL), ClinicalTrials.gov a Taylor & Francis Online pre obdobie rokov 2015–2025. Zahrnuté boli randomizované kontrolované štúdie a kvázi-experimentálne štúdie. Celkovo bolo zahrnutých 10 štúdií. Kvalita bola hodnotená pomocou nástroja Joanna Briggs Institute a výsledky boli syntetizované naratívne.

Výsledky: Väčšina štúdií preukázala, že nefarmakologické intervencie znižujú procedurálnu bolesť a úzkosť. Senzorické a psychologické prístupy, ako virtuálna realita, muzikoterapia, riadená imaginácia a aromaterapia, vykazovali konzistentnejšie účinky ako fyzikálne intervencie. Vyššia účinnosť bola pozorovaná u detských pacientov a pri opakovanej aplikácii intervencií.

Záver: Nefarmakologické intervencie predstavujú efektívny doplnok manažmentu bolesti pri ošetrovaní rán a podporujú pacientsky orientovanú starostlivosť. Na posilnenie dôkazov sú potrebné ďalšie kvalitné štúdie.

Kľúčové slová: Procedurálna bolesť. Ošetrovanie rán. Nefarmakologické intervencie. Manažment bolesti. Ošetrovateľská prax.

INTRODUCTION

Pain, as defined by the International Association for the Study of Pain, is an unpleasant sensory and emotional experience associated with actual or potential tissue damage (International Association for the Study of Pain, 2020). It remains a major global public health concern, with prevalence increasing from 26.3 % in 2009 to 32.1 % in 2021 (Macchia, 2022). In Asia, prevalence varies widely due to demographic and healthcare differences, and underestimation of pain often leads to inadequate management (Yongjun et al., 2020; Faisal, 2022).

Uncontrolled pain has multidimensional consequences, including impaired quality of life, reduced functional capacity, psychological distress, and delayed wound healing, which may prolong hospitalization and increase healthcare costs (Pacific, 2023; Becerra-bolaños et al., 2023). Although pharmacological therapies are widely used, they may cause

adverse effects, tolerance, and dependency. These limitations have increased interest in non-pharmacological interventions as complementary approaches (McDonagh et al., 2020).

Non-pharmacological interventions include physical, psychological, and sensory approaches such as relaxation techniques, guided imagery, music therapy, aromatherapy, and thermal therapies. These interventions may reduce pain through attention diversion, activation of relaxation responses, and modulation of cognitive and emotional processes (Veen et al., 2024). Previous studies have shown their effectiveness in reducing pain and anxiety across various clinical settings (Fan et al., 2020; Yıldız et al., 2024).

Procedural pain during wound care, particularly during dressing changes, remains a common clinical problem that is often inadequately managed. Despite standard analgesia, patients frequently experience significant pain, which may reduce cooperation, increase anxiety, and negatively affect care outcomes. However, existing studies are heterogeneous in terms of intervention types, methodologies,

and outcomes, making the evidence difficult to synthesize.

Therefore, this systematic review aims to identify, critically appraise, and synthesize evidence on the effectiveness of non-pharmacological interventions in reducing procedural pain and anxiety during wound care in pediatric and adult populations.

METHODS

This systematic review aimed to identify and synthesize evidence on the effectiveness of non-pharmacological interventions in reducing procedural pain during wound care. The review followed PRISMA 2020 guidelines and was conducted using the PICOS framework.

A comprehensive literature search was performed in Scopus, PubMed/MEDLINE, ScienceDirect, EBSCO (CINAHL), ClinicalTrials.gov, and Taylor & Francis Online for studies published between 2015 and 2025. The search strategy combined terms related to wound care, procedural pain, and non-pharmacological interventions. References were managed using Mendeley, and duplicates were removed prior to screening.

Table 1 Summary of Study Results

No	Author (Year)	Design	Intervention	Sample (n)	Setting	Key Findings
1	Daneshpajoo (2019)	RCT	Aromatherapy / Benson relaxation (20 – 30 min, 3 days)	132 adults	Burn hospital (Iran)	Significantly reduced anxiety; combination showed greatest effect ($p < 0.05$)
2	Ghezeljeh (2017)	Quasi-experimental	Massage (20 min, 3 days)	60 adults	Burn unit	No significant effect on pain or anxiety ($p > 0.05$)
3	Xiang (2021)	RCT	Active vs passive virtual reality	90 children	Outpatient Burn Clinic	Active VR significantly reduced pain compared with control ($p < 0.05$)
4	Armstrong (2022)	RCT	Mobile VR (10 – 20 min/session)	24 children	Clinic and home-based care	Reduced pain scores by $\geq 30\%$ compared with control ($p < 0.05$)
5	Belhan (2025)	RCT	Virtual reality during dressing	71 adults	Wound care clinic	No statistically significant reduction in pain or anxiety
6	Hsu (2016)	RCT	Music therapy (5 days)	70 adults	Burn center	Significantly reduced pain and anxiety ($p < 0.05$)
7	Ulfa (2020)	Quasi-experimental	Cold compress	16 post-partum patients	Primary healthcare	Significantly reduced pain intensity ($p = 0.003$)
8	Akgül (2021)	RCT	Lavender aromatherapy	Pediatric patients	Burn care setting	Significantly reduced pain levels ($p < 0.05$)
9	Aghakhani (2022)	RCT	Guided imagery (4 days)	70 adults	Burn unit	Significantly reduced pain and anxiety ($p < 0.05$)
10	Chattinnakorn (2020)	RCT	Cold water during NPWT	27 adults	Wound care unit	Reduction in pain observed, but statistical significance not reported

Eligible studies included randomized controlled trials and quasi-experimental designs involving pediatric or adult patients undergoing wound care. Interventions comprised physical, psychological, or sensory non-pharmacological approaches. Comparators included standard care or control conditions. Primary outcomes were pain intensity and procedural anxiety measured using validated instruments. Non-eligible studies included reviews, qualitative studies, and articles without relevant outcomes.

Study selection was conducted independently by two reviewers. From 4,017 identified records, 10 studies met the inclusion criteria after screening and eligibility assessment.

Data extraction was performed using a standardized form, including study characteristics, interventions, and outcomes. Methodological quality was assessed using the Joanna Briggs Institute Critical Appraisal Tools. Six studies were classified as high quality and four as moderate quality. Due to heterogeneity in study design and outcome measures, a narrative synthesis was conducted.

RESULTS

Study Selection

A total of 4,017 records were identified through database searching. After duplicate removal and initial screening, 1,760 records were assessed based on titles and abstracts, resulting in 1,645 exclusions.

Of the 115 full-text articles sought, 78 were assessed for eligibility, and 68 were excluded due to inappropriate design or irrelevant outcomes. Ultimately, 10 studies met the inclusion criteria and were included in the final analysis (Figure 1; Table 2).

Study characteristics

The included studies were conducted across several countries, including Iran, Turkey, the United States, Taiwan, Thailand, and Indonesia, involving both pediatric and adult populations. The designs consisted of randomized controlled trials and quasi-experimental studies, predominantly in burn care settings. Eight out of ten studies reported statistically significant reductions in pain intensity and/or anxiety, indicating an overall positive trend, although heterogeneity in measurement tools and timing limited direct comparability.

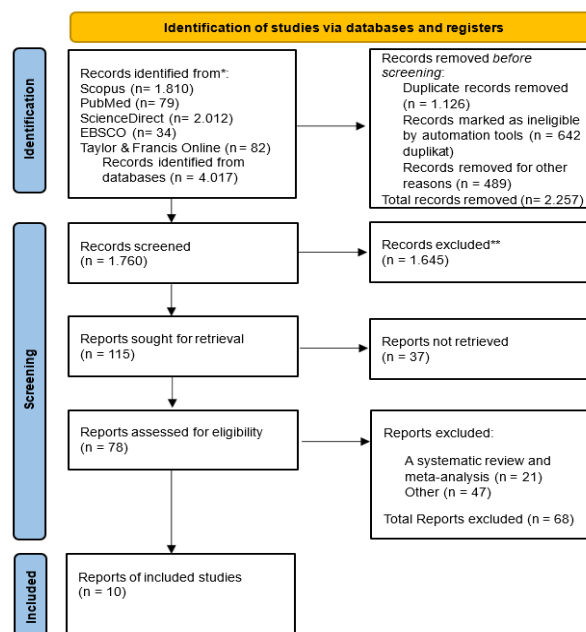


Figure 1 PRISMA 2020 flow diagram

Settings and participants

Most studies were conducted in hospital environments, particularly burn units and wound care centers, with additional studies in outpatient clinics, community healthcare, and home-based care settings. Participants were mainly adults with acute burn injuries, while several studies focused on pediatric populations using technology-based interventions. Evidence for chronic wounds and postpartum patients was limited. Greater effectiveness was generally observed in pediatric populations, particularly with distraction-based approaches.

Types of interventions

Interventions were classified into physical, psychological, and sensory approaches. Physical methods included massage and cold applications, while psychological interventions involved relaxation techniques and guided imagery. Sensory approaches, such as music therapy, aromatherapy, and virtual reality, demonstrated more consistent and robust effects in reducing procedural pain compared to physical methods.

Technology, duration, and frequency

Interventions ranged from simple techniques (e.g., cold compresses, aromatherapy) to advanced technologies such as virtual reality. Most interventions were short in duration (10 – 30 minutes) and aligned with wound care procedures. Both single-

Table 2 JBI Critical Appraisal Assessment

No.	Author (Year)	Study	Limitations	Methodological quality	JBI Score*
1	Daneshpajoo et al., 2019	Aromatherapy and Benson relaxation in burn patients	Single-center design; short intervention period; lack of blinding	High	11/13
2	Ghezeli et al., 2017	Massage for procedural pain in burn patients	Non-randomized design; limited control of confounders	Moderate	6/9
3	Xiang et al., 2021	Virtual reality distraction in pediatric burn patients	Pediatric-only population; short-term outcomes	High	12/13
4	Armstrong et al., 2022	Mobile VR for home burn care	Small sample size; feasibility study design; attrition bias	Moderate	9/13
5	Belhan et al., 2025	VR in chronic wound care	Lack of blinding; heterogeneity of wound types	High	10/13
6	Hsu et al., 2016	Music therapy during dressing changes	Single-center design; limited long-term follow-up	High	10/13
7	Ulfa et al., 2020	Cold compress for postpartum wound pain	Small sample size; non-randomized design; lack of blinding	Moderate	5/9
8	Akgül et al., 2021	Lavender aromatherapy in pediatric burns	Unclear blinding; subjective outcome measures	High	11/13
9	Aghakhani et al., 2022	Guided imagery during dressing changes	Single-blind design; short intervention duration	High	11/13
10	Chattinnakorn et al., 2020	Cold water during NPWT dressing	Small sample size; unclear washout period	Moderate	10/13

Legend: *JBI appraisal tools differ by study design (RCT = 13 items; quasi-experimental = 9 items).

session and repeated interventions were applied, with repeated applications over several days showing more stable effects. Effectiveness was not solely dependent on technological complexity, as low-cost interventions also demonstrated significant benefits.

Risk of bias

Methodological quality assessment indicated that six studies were of high quality and four were of moderate quality. Common limitations included small sample sizes, lack of blinding, and short intervention durations. Despite these limitations, the overall evidence suggests moderate to high reliability, although heterogeneity and potential bias should be considered when interpreting the findings.

DISCUSSION

This systematic review demonstrates that most non-pharmacological interventions are effective in reducing procedural pain and anxiety during wound care, with eight of ten studies reporting significant improvements. These findings support the role of non-pharmacological strategies as important adjuncts to standard care, although effectiveness may

vary depending on intervention type, patient characteristics, and clinical context (Belhan et al., 2025; Chattinnakorn et al., 2020; Ghezeli et al., 2017).

Sensory and psychological interventions showed more consistent and robust effects compared to physical approaches. Interventions such as virtual reality, music therapy, aromatherapy, and guided imagery demonstrated significant reductions in pain and anxiety across multiple studies (Aghakhani et al., 2022; Akgül et al., 2021; Armstrong et al., 2022; Hsu et al., 2016), whereas physical methods, including massage, produced less consistent outcomes (Ghezeli et al., 2017).

Greater effectiveness was observed in pediatric populations, particularly with immersive distraction techniques such as virtual reality, which significantly reduced pain intensity (Armstrong et al., 2022; Xiang et al., 2021). This finding aligns with cognitive and attentional theories of pain modulation. In contrast, reduced effectiveness in adults with chronic wounds may reflect more complex pain mechanisms, including central sensitization (Belhan et al., 2025).

Intervention, timing and frequency also influenced outcomes. Short, procedure-aligned interventions (10-30 minutes) were sufficient to achieve

meaningful pain reduction, while repeated applications over several days produced more stable and cumulative effects (Aghakhani et al., 2022; Daneshpajoo et al., 2019).

Although advanced technologies such as virtual reality demonstrated strong analgesic potential, simpler and low-cost interventions, including aromatherapy and music therapy, achieved comparable benefits (Akgül et al., 2021; Hsu et al., 2016). This suggests that effectiveness is more closely related to cognitive and emotional engagement than to technological complexity.

The variability in findings can be explained by different theoretical mechanisms. Physical interventions may operate through the Gate Control Theory (Chattinnakorn et al., 2020; Ulfa & Monica, 2020), whereas sensory and psychological approaches align with cognitive-behavioral models of pain modulation (Daneshpajoo et al., 2019; Hsu et al., 2016). However, heterogeneity in study design, sample size, and outcome measurement limits comparability and generalizability. Therefore, while the overall evidence supports integrating non-pharmacological interventions into clinical practice, cautious interpretation across settings and populations remains necessary.

Limitations

This review has several limitations. Restriction to English-language publications and limited access to full-text articles may have introduced selection and publication bias. The included studies were geographically concentrated and predominantly focused on burn populations, limiting generalizability. Additionally, heterogeneity in study design, intervention protocols, and outcome measurement tools reduces comparability across studies. The absence of meta-analysis also limits the ability to estimate overall effect size.

CONCLUSION

Non-pharmacological interventions, particularly sensory and psychological approaches, are effective and feasible adjuncts for reducing procedural pain and anxiety during wound care. Interventions such as virtual reality, music therapy, guided imagery, and aromatherapy demonstrate consistent benefits, especially in pediatric populations. Short, procedure-aligned interventions are sufficient to achieve meaningful outcomes. These findings support the integration of non-pharmacological strategies into

clinical practice to enhance patient-centered care. Further high-quality, standardized studies are needed to strengthen the evidence base and improve generalizability.

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