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Music Interventions in Anxiety and Pain Management in Patients Undergoing Total Knee and Hip Arthroplasty

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ABSTRACT: Background: Preoperative anxiety and postoperative pain represent two prominent clinical challenges in patients undergoing total knee arthroplasty (TKA) and total hip arthroplasty (THA). Music interventions, encompassing passive music listening and therapist-guided music therapy, are attracting growing interest as safe, low-cost non-pharmacological options within perioperative opioid-minimization strategies.
Objectives: To synthesize and critically appraise scientific evidence from 2020 to 2025 on the effectiveness of music interventions for anxiety and pain in arthroplasty patients; to clarify proposed neurobiological mechanisms; to identify moderating factors of outcomes; and to discuss clinical implications and priority research directions.
Methods: A narrative review with transparent search, conducted in accordance with SANRA guidelines, was performed. This approach was selected to enable critical synthesis and conceptual integration across diverse study designs, including randomized controlled trials (RCTs), systematic reviews, and mechanistic studies, rather than providing a quantitative pooled estimate. Purposive searches were conducted across five electronic databases for the period 2020 to 2025. Evidence was stratified according to its degree of directness to the TKA/THA population: core evidence from studies conducted specifically in orthopaedics and joint arthroplasty; contextual evidence from multispecialty perioperative meta-analyses; and mechanistic evidence from neurobiological research.
Main Results: Evidence suggests that music interventions are associated with reductions in preoperative anxiety and postoperative pain of small to moderate effect size in orthopaedic populations (standardized mean difference [SMD] approximately -0.27 to -0.40; a negative SMD denotes reduction in the intervention group relative to the control group). One TKA-specific meta-analysis found no statistically significant reduction in pain Visual Analogue Scale (VAS) scores, yet documented significant shift in autonomic nervous system balance. Contextual evidence from multispecialty meta-analyses yielded larger effect sizes (SMD approximately -0.90) that cannot be directly extrapolated to TKA/THA. Evidence regarding prevention of postoperative delirium remains indirect.
Conclusions: Current evidence suggests that music interventions may confer clinical benefit in perioperative management of joint arthroplasty. However, TKA/THA-specific evidence remains more limited than that available for broader surgical populations and requires reinforcement by adequately powered, multicenter randomized controlled trials.

KEYWORDS: music intervention; total knee arthroplasty; total hip arthroplasty; preoperative anxiety; narrative review

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1. INTRODUCTION

Total knee arthroplasty (TKA) and total hip arthroplasty (THA) are two of the most commonly performed orthopaedic procedures worldwide, with hundreds of thousands of cases carried out annually. This upward trend is occurring in parallel with global population ageing and the growing burden of chronic osteoarthritis, placing increasing demands on healthcare systems in many countries, including those in the Asia-Pacific region (Abate et al., 2020).

Although TKA and THA confer substantial long-term functional and analgesic benefits, the perioperative period harbours numerous complex and procedure-specific clinical challenges. Preoperative anxiety is common among adult surgical patients in general (Aguero-Millan et al., 2023). In the arthroplasty population, which predominantly comprises elderly patients with multiple comorbidities and a prolonged history of chronic pain, the anxiety burden presents distinct characteristics. Sorel et al. (2020), in a review analysing 29 studies, confirmed that preoperative anxiety and depression are independently associated with postoperative pain intensity, total opioid consumption, length of hospital stay, and long-term patient satisfaction following TKA.

Pain following TKA and THA is classified among the most severe postoperative pain encountered in orthopaedic surgery. Multimodal analgesia is the current standard of practice; however, opioid use carries several adverse consequences in elderly patients, including nausea, constipation, respiratory depression, and particularly postoperative delirium (POD). POD is a relatively common complication following arthroplasty in older patients; reported incidence varies widely depending on diagnostic criteria and the characteristics of the study population. POD is associated with worse short-term outcomes and increased resource use; older arthroplasty patients are at particular risk (Chiang et al., 2022).

A clinically important feature of TKA is the increasing preference for spinal anaesthesia over general anaesthesia. Under spinal anaesthesia, patients often remain conscious or lightly sedate throughout the procedure and are therefore exposed to the distinctive acoustic environment of the orthopaedic operating room. Noise generated by surgical instruments is typically high; operating-room noise during arthroplasty can be substantial, and has been proposed to activate sympathetic arousal in these patients, substantially above established occupational noise safety thresholds. This environment has been proposed as capable of activating the sympathetic nervous system in awake patients (Ginsberg et al., 2022), thereby increasing anxiety and the requirement for supplemental sedation. In this setting, an RCT in TKA under spinal anaesthesia compared self-selected music delivered via noise-cancelling headphones with noise-cancellation alone, using sedation request and propofol dose as primary outcomes (Tran et al., 2020).

Music interventions, encompassing passive music listening (music medicine) and therapist-guided music therapy, are attracting growing interest as non-pharmacological solutions capable of simultaneously addressing multiple perioperative challenges: reducing preoperative anxiety, controlling postoperative pain, limiting opioid and sedative use, and providing positive auditory stimulation to mask operating room noise. Music interventions are non-invasive, have no known adverse effects, are low-cost, and can be integrated into existing perioperative care protocols (Park et al., 2024; Van Bergen et al., 2025).

Despite their evident clinical potential, music interventions have not yet been formally incorporated into practice guidelines for joint arthroplasty. TKA/THA-specific evidence remains limited in terms of number and scale of studies, while the majority of published meta-analyses include heterogeneous surgical populations. A critical synthesis with clear evidence stratification is therefore necessary to avoid invalid extrapolation and to guide both clinical application and future research design.

This narrative review was conducted with four objectives: to synthesize and critically appraise evidence from 2020 to 2025 on the effectiveness of music interventions in joint arthroplasty; to clarify proposed neurobiological mechanisms; to identify factors moderating intervention effectiveness; and to discuss clinical implications and priority research directions.

2. BACKGROUND

Regarding the distinctive clinical context of joint arthroplasty, TKA/THA patients present an anxiety and pain profile that differs from many other orthopaedic procedures. The majority are elderly patients with multiple comorbidities and a prolonged history of chronic joint pain. Chronic pain processes may involve central sensitization, rendering postoperative pain perception more complex. Approximately half of arthroplasty patients may exhibit symptoms of anxiety or depression at some point during the perioperative period. The review by Sorel et al. (2020) demonstrated that preoperative anxiety and depression are associated with postoperative pain intensity, opioid consumption, length of hospital stay, and long-term patient satisfaction following TKA.

In the operating room environment for joint arthroplasty, particularly when TKA is performed under spinal anaesthesia, conscious patients are exposed to high levels of surgical instrument noise; some studies have recorded mean levels of approximately 85 dBA with peaks exceeding 100 dB. The review by Ginsberg et al. (2022) described how surgical noise can activate the sympathetic nervous system, increasing heart rate, blood pressure, and anxiety. In this context, music delivered via personal headphones simultaneously creates a positive auditory experience and masks the noise, a relative advantage rarely offered by other non-pharmacological interventions in the same setting.

In addition to the operating room noise context, another clinically important issue in elderly arthroplasty patients is postoperative delirium (POD), a significant outcome associated with prolonged hospital stay, increased costs, and risk of cognitive decline. Because anxiety, pain, opioids, and benzodiazepines are all recognized predisposing factors for POD, reducing anxiety and pain through non-pharmacological means is considered a theoretically well-grounded approach, even though direct evidence in TKA/THA remains limited (Chiang et al., 2022).

Regarding neurobiological mechanisms of action, recent mechanistic studies and reviews describe multiple pathways potentially involved in the effects of music on pain and anxiety. Pleasant music has been associated with activation of the mesolimbic reward system and dopamine release; a hypothesis regarding the role of beta-endorphins via μ-opioid receptors in pain modulation has also been proposed, although the causal chain in the surgical context has not been fully established (Arnold et al., 2024). At the autonomic nervous system level, music may reduce sympathetic activity and increase parasympathetic activity, as reflected by heart rate variability (HRV); a meta-analysis in TKA patients by Yu et

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al. (2020) documented improvement in the LF/HF ratio, even when VAS pain scores did not change significantly. At the cognitive level, music generates attentional distraction, competing for processing resources with pain signals and aligning with the gate control theory of pain. Furthermore, familiar music may activate positive autobiographical memories and enhance a sense of control, which may explain why patient-selected music typically yields better outcomes than pre-programmed music (Lin et al., 2020; Ginsberg et al., 2022).

3. METHODS

This article is designed as a narrative review with transparent search, conducted in accordance with SANRA guidelines (Baethge et al., 2019). The narrative review methodology was selected as appropriate for the objective of critical synthesis and conceptual integration across diverse research designs, including RCTs, systematic reviews, and mechanistic studies, rather than providing a quantitative pooled estimate. The review aims to provide critical synthesis with conceptual integration and does not aspire to the comprehensive enumeration of a systematic review. Literature searching was conducted to enhance transparency and minimize selection bias, and was not intended for quantitative synthesis; no meta-analysis or systematic risk-of-bias scoring was performed, consistent with SANRA guidance.

Consistent with the narrative review design, this article applies purposive and selective inclusion criteria. Priority was given to RCTs and systematic reviews conducted specifically in orthopaedics or lower-limb arthroplasty; perioperative studies with clearly described music interventions; and neurobiological studies examining the mechanisms of music on pain and anxiety within the period 2020 to 2025. Multispecialty perioperative meta-analyses were included as contextual evidence, with explicit notes regarding the limitations of extrapolation. Materials excluded from this synthesis include paediatric studies, non-peer-reviewed conference abstracts, single case reports, and publications prior to 2020, with the exception of clearly noted background historical references.

Literature searches were conducted in September 2025 across five electronic databases: PubMed/MEDLINE, Cochrane Library (CENTRAL), Embase, CINAHL Complete, and Web of Science. The time frame applied was January 2020 to September 2025, restricted to full-text, peer-reviewed, English-language publications. The search strategy was constructed according to three conceptual groups: (i) the arthroplasty population, including the terms TKA, THA, arthroplasty, joint replacement, and equivalent variants; (ii) music interventions, including music intervention, music medicine, music therapy, perioperative music, intraoperative music, and music listening; and (iii) outcomes, including anxiety, pain, postoperative pain, opioid consumption, sedation, delirium, heart rate variability, and the measurement instruments STAI, HADS, VAS, and NRS. Keywords and search combinations were adapted to the syntax and indexing systems of each database (MeSH for MEDLINE; Emtree for Embase). Supplementary searching was conducted via bidirectional citation tracking of selected articles.

Evidence was stratified into three clearly defined tiers, which guided the entire synthesis and interpretation process. Tier 1 (Core Evidence) comprised RCTs, controlled studies, and systematic reviews conducted specifically in orthopaedics or lower-limb arthroplasty, and was used to derive conclusions directly applicable to TKA/THA. Tier 2 (Contextual Evidence) comprised meta-analyses and systematic reviews conducted in multispecialty surgical populations, used solely to contextualize effect sizes and mechanisms, and not interpreted as direct evidence for TKA/THA. Tier 3 (Mechanistic Evidence) comprised neurobiological and psychophysiological studies addressing the mechanisms of music, providing the conceptual framework for clinical observations. This stratification was maintained consistently throughout the article, allowing the narrative review to avoid invalid extrapolation when combining evidence from different populations.

Regarding outcome measurement and clinical significance assessment, anxiety in arthroplasty surgery was measured using the State subscale of the State-Trait Anxiety Inventory (STAI-S), the Visual Analogue Scale for anxiety (VAS-A), or the Hospital Anxiety and Depression Scale (HADS-A). Pain was measured using the Visual Analogue Scale (VAS) or the Numeric Rating Scale (NRS). Assessment of the clinical significance of statistical effects must be conducted with caution. The minimum clinically important difference (MCID) depends on the measurement instrument, the clinical context, and the time point of assessment; no fixed threshold can be universally applied across all studies. Furthermore, direct conversion from SMD to clinical thresholds is not straightforward due to differences in measurement scales and timing across studies. Accordingly, remarks regarding clinical significance in this article are presented with appropriate caution, focusing on direction and relative magnitude of effect rather than comparison with absolute thresholds. Key secondary outcomes in the arthroplasty context include total opioid consumption, requirement for supplemental sedation during spinal anaesthesia, incidence of POD assessed by the Confusion Assessment Method (CAM), heart rate variability, and patient satisfaction. Heterogeneity in the selection and timing of outcome measurement represents one of the principal methodological limitations of the current evidence base.

4. RESULTS

Evidence is presented according to four groups of clinical outcomes, stratified by degree of directness to the TKA/THA population. Table 1 summarizes the core studies and serves as a cross-reference throughout this section.

4.1. Perioperative Anxiety

Evidence close to the target population from orthopaedic studies including arthroplasty patients suggests that music interventions are associated with reductions in perioperative anxiety. The meta-analysis by Patiyal et al. (2021), synthesizing 13 studies (10 RCTs and 3 quasi-experimental studies; n = 778) in a mixed orthopaedic population including TKA, THA, and major fractures, found a statistically significant reduction in anxiety (SMD = -0.40; 95% CI -0.63 to -0.18; p = 0.0009), with the negative SMD indicating lower anxiety scores in the intervention group. This finding reflects a small to moderate anxiety-reducing effect in the orthopaedic context, although the degree of extrapolation to a purely TKA/THA population requires caution given population differences.

Direct evidence in the target population (TKA under spinal anaesthesia) remains limited. In an RCT, self-selected music delivered via noise-cancelling headphones was compared with noise-cancellation alone; the primary outcomes (sedation request and propofol dose) did not differ significantly between groups (Tran et al., 2020). Secondary patient-reported outcomes (including anxiety measures) showed favourable trends, but these findings should be interpreted cautiously given the study design and sample size. Rohden et al. (2024), in a multispecialty

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systematic review, concluded that there is moderate-level evidence supporting preoperative anxiety reduction and emphasized the need for protocol standardization.

Regarding moderating factors, evidence consistently indicates that individualization of music selection is a critical determinant. Lin et al. (2020), in a systematic review and meta-analysis specifically in orthopaedics, confirmed that patient-selected music appeared to yield better outcomes than pre-programmed music in subgroup/moderator analyses (Lin et al., 2020) consistent with the mechanisms of emotional connection and personal memory. Park et al. (2024), in a systematic review of 21 trials on technology-based music interventions, confirmed that personal headphones yielded better outcomes than external speakers, a finding consistent with the advantage of masking surgical noise in TKA.

4.2. Postoperative Pain

Evidence regarding postoperative pain is more complex than for anxiety and requires careful tier-by-tier reading. Patiyal et al. (2021) found a statistically significant pain reduction in the mixed orthopaedic population (SMD = -0.27; 95% CI -0.44 to -0.11; p = 0.002). This is a small effect size, yet one with potential clinical relevance as an adjunct within a multimodal analgesia strategy. More notably, the TKA-specific systematic review by Yu et al. (2020), analysing 8 RCTs (n = 555), the majority involving passive music listening, found no statistically significant reduction in VAS pain scores. This result reflects the complexity of pain following arthroplasty and emphasizes that the pain effect size in the TKA-specific population is smaller than in the mixed orthopaedic population.

In the post-anaesthesia care unit (PACU), evidence for early pain reduction is comparatively more consistent. Poulsen et al. (2021) reported reductions in NRS pain scores and in rescue analgesia requirements in TKA/THA patients immediately postoperatively. Brown et al. (2024), in a quality improvement initiative (n = 100 TKA patients) in the PACU, documented reductions in NRS pain scores and Richmond Agitation-Sedation Scale (RASS) agitation scores compared with a historical control group. Although both studies have design limitations, they provide evidence of clinical feasibility and suggest that the PACU represents a particularly suitable perioperative phase for music intervention. Contextual evidence from Li et al. (2024), with comparatively larger effect sizes in multispecialty surgical populations, cannot be directly extrapolated to TKA/THA. The gap between SMD of approximately -0.27 in orthopaedic-specific populations and SMD of approximately -0.90 in multispecialty populations reflects genuine differences between these populations, not inconsistency within the evidence base.

4.3. Drug-Related Outcomes and Physiological Markers

Regarding opioid use, Patiyal et al. (2021) found no statistically significant opioid reduction in the mixed orthopaedic population, although a trend toward reduction was noted in several individual trials. Regarding sedation requirements, a randomized controlled trial in TKA under spinal anaesthesia compared self-selected music plus noise-cancellation with noise-cancellation alone, using sedation request and propofol dose as primary endpoints; no statistically significant differences were observed (Tran et al., 2020). Although minimizing supplemental sedation carries considerable clinical importance due to the risks in elderly patients, this small-sample trial was likely underpowered to detect such a difference.

Autonomic nervous system physiological markers provide important supplementary evidence. Yu et al. (2020) documented a significant decrease in the LF/HF ratio of heart rate variability (HRV) ($p < 0.05$) in TKA patients, even when the VAS pain outcome did not reach statistical significance. HRV improvement reflects a shift in autonomic balance toward increased parasympathetic activity, consistent with the music-mediated stress reduction mechanism proposed by Ginsberg et al. (2022). Regarding functional recovery, Yu et al. (2020) also noted an increase in knee range of motion (ROM) during continuous passive motion therapy in the intervention group, suggesting that music intervention may support early motor rehabilitation through anxiety reduction and improvement in autonomic balance.

4.4. Postoperative Delirium and Evidence Gaps

No clinical trial within the scope of this review evaluated postoperative delirium (POD) as a primary outcome in a TKA/THA-specific population. This represents a critical evidence gap that must be clearly recognized before any clinical recommendation can be made regarding the role of music interventions in POD prevention.

The rationale for the potential POD prevention benefit is constructed from multi-tiered biological reasoning: reducing anxiety and pain decreases the requirement for opioids and benzodiazepines, two well-established precipitants of POD; improvement in autonomic balance via HRV may reflect reduced baseline physiological arousal that predisposes to POD; and the provision of structured auditory stimulation may serve a reality-orientation function analogous to components of the Hospital Elder Life Program. Chiang et al. (2022) proposed a theoretical framework for this rationale in a narrative review of music-based interventions in orthopaedic surgery.

However, biological reasoning, however theoretically coherent, cannot substitute for direct clinical evidence. POD prevention in arthroplasty requires RCTs specifically designed with POD as the primary outcome, adequate statistical power (generally requiring several hundred patients given the relatively low POD incidence), a purely TKA/THA population with preoperative cognitive assessment, and follow-up of at least 72 hours postoperatively. This represents the most urgent research priority in the field.

Table 1. Summary of evidence on music interventions in orthopaedic and joint arthroplasty surgery (2020 to 2025)

Author (Year)	Design / n	Population	Intervention	Primary Outcomes	Results and Limitations
Patiyal et al. (2021)	SR and MA; 13 studies; n = 778	Mixed orthopaedic (TKA, THA, major fractures)	Passive music listening (majority), pre/intra/postoperative	VAS pain, STAI anxiety, opioids	Pain: SMD = -0.27 (p = 0.002). Anxiety: SMD = -0.40 (p = 0.0009). Negative SMD denotes reduction in intervention group. Opioids: not statistically significant. Limitations: I2 > 60%; mixed population.

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Yu et al. (2020)	SR and MA; 8 RCTs; n = 555	TKA-specific	Passive music listening (music medicine), pre/intra/postoperative	VAS pain, anxiety, HRV, ROM	VAS pain: not statistically significant. LF/HF HRV: significant decrease ($p < 0.05$). Knee ROM: increased Limitations: limited statistical power for VAS outcome.
Lin et al. (2020)	SR and MA; orthopaedic	Orthopaedic (including TKA)	Comparison of patient-selected vs. pre-programmed music	VAS pain, moderator analysis	Patient-selected music yielded significantly better outcomes: music medicine $p = 0.002$; music therapy $p = 0.02$. Mechanism: emotional connection and personal memory.
Tran et al. (2020)	RCT; TKA under spinal anaesthesia	TKA-specific; spinal anaesthesia	Music medicine: self-selected music via headphones intraoperatively	Sedation request, propofol dose ; STAI-S and satisfaction	Primary outcomes (sedation request, propofol dose): no statistically significant between-group differences versus noise-cancellation alone. Secondary outcomes (postoperative pain/opioids): no clear between-group differences. Limitations: single-center; sample size may limit detection of small effects
Poulsen et al. (2021)	Pre-post comparison; TKA and THA in PACU	TKA and THA in PACU	Music medicine: passive music listening upon PACU admission	NRS pain, VAS anxiety, rescue analgesia	Significant reductions in NRS pain and VAS anxiety. Reduced rescue analgesia. Limitations: non-randomized; quality improvement design.
Brown et al. (2024)	Quality improvement; n = 100 TKA; PACU	TKA in PACU	Music medicine: passive classical music in PACU	NRS pain, RASS agitation, opioids	Reductions in NRS and RASS vs. historical control group. Limitations: historical control comparison; high risk of selection bias.

SR: Systematic Review; MA: Meta-Analysis; RCT: Randomized Controlled Trial; TKA: Total Knee Arthroplasty; THA: Total Hip Arthroplasty; PACU: Post-Anaesthesia Care Unit; HRV: Heart Rate Variability; LF/HF: Low-to-High Frequency ratio; ROM: Range of Motion; CPM: Continuous Passive Motion; RASS: Richmond Agitation-Sedation Scale; STAI-S: State-Trait Anxiety Inventory, State subscale; VAS: Visual Analogue Scale; NRS: Numeric Rating Scale.

5. DISCUSSION

Evidence stratification for the period 2020 to 2025 enables the synthesis of three principal conclusions. For each conclusion, the degree of narrative confidence is determined by the proximity of the evidence to the TKA/THA population and by consistency across studies.

The first conclusion carries moderate narrative confidence and is derived from Tier 1: music interventions are associated with reductions in anxiety and pain in orthopaedics at small to moderate effect sizes (SMD approximately -0.27 to -0.40), consistent across the specific meta-analysis and orthopaedic reviews. This effect magnitude is sufficiently persuasive to warrant cautious clinical integration as an adjunct within multimodal analgesia strategies.

The second conclusion carries low narrative confidence: in TKA under spinal anaesthesia, music may be a relevant adjunct because it can be implemented during conscious phases and may improve the intraoperative experience; however, evidence for incremental reductions in sedation beyond noise-cancellation alone is not yet conclusive (Tran et al., 2020).

The third conclusion carries very low narrative confidence and is based on inference from Tier 2 and Tier 3 evidence: music intervention may have potential for preventing POD in elderly arthroplasty patients. No direct clinical evidence exists from TKA/THA-specific RCTs; the rationale is based entirely on mechanistic reasoning.

Contextual evidence from multispecialty perioperative meta-analyses, particularly Li et al. (2024) with SMD = -0.90, consistently suggests benefits of music interventions across a broader surgical scope. The substantial gap between multispecialty and orthopaedic-specific effect magnitudes may reflect multiple factors: arthroplasty patients present more complex pain thresholds due to chronic central sensitization, greater clinical complexity, and more robust multimodal analgesia regimens that reduce the room for improvement attributable to a single adjunct. This does not imply that music interventions are less effective in orthopaedics, but rather that expected effect magnitudes need to be calibrated more realistically compared with other specialties.

Regarding the position of music interventions within Enhanced Recovery After Surgery (ERAS) protocols for joint arthroplasty, they offer clear comparative advantages: low cost, non-invasive, no drug interactions, no specialized training required, and integrable into any

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perioperative phase. Van Bergen et al. (2025), in a cost-effectiveness analysis of music interventions in colorectal surgery, reported favourable health economic outcomes; a comparable analysis in TKA/THA does not yet exist and represents a necessary research priority.

Clinical practice implications: Given the favourable safety profile and low cost, music interventions may be considered as an adjunct within perioperative care for joint arthroplasty, particularly at time points when patients are awake: preoperatively, intraoperatively under spinal anaesthesia, and during the recovery period (Ginsberg et al., 2022; Chiang et al., 2022). Priority should be given to patient-selected music delivered via personal headphones to maximize individualization and minimize environmental interference (Lin et al., 2020; Park et al., 2024; Tran et al., 2020). However, given the heterogeneity of protocols and the limited TKA/THA-specific evidence, implementation recommendations should be regarded as provisional practice guidance, pending validation by dedicated trials.

Limitations of the current evidence: High heterogeneity reflects substantial inconsistency in music type, timing, duration, and outcome measurement across studies. Expectation bias cannot be entirely eliminated because blinding of patients in music intervention studies is not feasible. Many orthopaedic RCTs have small sample sizes with insufficient statistical power for secondary outcomes such as opioid consumption or POD. Lack of intervention protocol standardization remains the largest barrier to translating evidence into practice guidelines. Most studies followed patients for only 24 to 72 hours, which is insufficient to assess the impact on chronic post-surgical pain. The majority of studies used Western music with North American and European patients, yet the effectiveness of Asian indigenous music, including Vietnamese music, has not been adequately examined. Regarding the limitations of this review itself, the absence of comprehensive enumeration and systematic risk-of-bias scoring are important distinctions to note when interpreting findings.

6. CONCLUSIONS

This narrative review with transparent search synthesizes and critically appraises evidence from 2020 to 2025 on the effectiveness of music interventions in the management of anxiety and pain in patients undergoing total knee and hip arthroplasty, with evidence clearly stratified according to its degree of directness to the TKA/THA population.

Evidence from orthopaedic and arthroplasty studies suggests that music interventions are associated with reductions in anxiety and pain at small to moderate effect sizes (SMD approximately -0.27 to -0.40), consistent across the specific meta-analysis and orthopaedic reviews. Evidence for anxiety is comparatively more consistent than for pain; a TKA-specific meta-analysis found no statistically significant VAS reduction but documented significant autonomic nervous system physiological improvement. Orthopaedic-specific effect sizes are substantially smaller than those from multispecialty perioperative meta-analyses, and these two figures cannot be interpreted as equivalent.

TKA under spinal anaesthesia represents a particularly favourable clinical context for music interventions, owing to the dual advantage of a conscious or lightly sedated patient and a high-noise environment; however, direct evidence in this context derives from only one RCT with limited statistical power. Evidence for postoperative delirium prevention is entirely absent at the level of TKA/THA-specific clinical trials and represents an evidence gap requiring prioritized research.

Overall, evidence in the arthroplasty setting is promising but not as strong as in broader surgical populations. Music interventions merit cautious integration as a complementary component of multimodal perioperative management. Adequately powered, multicenter RCTs specifically designed for TKA/THA populations and accounting for diverse cultural contexts represent the necessary next step toward incorporating this safe, low-cost non-pharmacological intervention into formal practice guidelines.

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