

The Role of Music in Alleviating Anxiety and Boosting Performance in Nursing Simulations: A Review

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Abstract

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Background: Performance anxiety is a prevalent issue among nursing students during clinical simulations, potentially hindering learning and skill acquisition. Music intervention has emerged as a potential non-pharmacological approach to mitigate anxiety and enhance performance. This review synthesizes current evidence on the role of music in alleviating anxiety and boosting performance in nursing simulations, with a specific focus on findings from an Asian educational context.

Methods: A comprehensive review of the literature was conducted, focusing on experimental and observational studies that examined the effects of music on nursing students' anxiety levels, physiological stress indicators, self-efficacy, and simulation performance. The review critically appraises a key randomized controlled trial conducted in an Asian setting and integrates its findings with the broader evidence base.

Results: The reviewed evidence consistently demonstrates that music intervention significantly reduces both self-reported anxiety and physiological indicators of stress, including heart rate and mean arterial pressure, during nursing simulations. Furthermore, music exposure is associated with improved performance as evaluated by instructors. However, the impact of music on self-efficacy appears inconsistent across studies. The low-cost, non-invasive nature of music intervention enhances its practical applicability in nursing education.

Conclusion: Music serves as an effective, accessible tool for creating a more supportive learning environment in nursing simulation education. Its implementation can reduce anxiety and improve performance, thereby potentially enhancing clinical competence. Future research should explore optimal music genres, timing, and duration of exposure, as well as the long-term effects of music intervention on clinical practice transitions.

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Introduction

Nursing education worldwide faces the critical challenge of preparing students for the high-stakes, high-stress environment of clinical practice. Simulation-based learning has become an indispensable pedagogical tool, providing a bridge between theoretical knowledge and real-world application by offering a controlled, safe environment for skill development and clinical reasoning (1, 2). Despite its benefits, the simulation environment itself can induce significant

performance anxiety among nursing students (3, 4). This anxiety, characterized by physiological arousal and cognitive worry, can impair performance, hinder learning, and negatively impact students' self-confidence and self-efficacy—a key construct from social cognitive theory referring to an individual's belief in their capacity to execute behaviors necessary to produce specific performance attainments (5).

The pressure to perform accurately, the fear of making mistakes in a simulated yet evaluative setting,

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and the anticipation of instructor feedback are potent stressors (6). Physiologically, this often manifests as increased heart rate and blood pressure, which can further impede cognitive function and psychomotor skills (7). In the dynamic and demanding healthcare landscape of Asia, with its growing need for highly competent nurses, addressing this educational bottleneck is paramount (8, 9).

In search of practical and cost-effective interventions, educators and researchers have turned to non-pharmacological anxiety-reduction strategies. Among these, music listening has garnered significant attention for its psychophysiological effects (10). Music has been demonstrated to possess calming and distracting properties, capable of reducing subjective stress and modulating the autonomic nervous system, leading to lower heart rate and blood pressure (11, 12). Its efficacy has been explored in various clinical contexts, such as reducing preoperative anxiety in patients (13) and enhancing procedural skills learning in medical trainees (14).

However, the specific application and effectiveness of music within the unique context of nursing simulation, particularly in Asian educational settings with distinct cultural and pedagogical nuances, require consolidated examination. This review aims to synthesize the existing evidence on the role of music in alleviating anxiety and boosting performance in nursing simulations. It will critically analyze findings from a pivotal study conducted in an Asian context, integrate these with the broader literature, discuss potential mechanisms, and identify implications for nursing education and future research directions.

Theoretical Framework and Mechanisms of Action

The anxiolytic and performance-enhancing effects of music can be understood through several theoretical lenses. The most prominent is the *Arousal and Mood Theory*, which posits that music can influence emotional states and physiological arousal levels (15). Soothing, slow-tempo music can lower arousal, counteracting the hyper-arousal associated with anxiety, thereby creating an optimal state for learning and performance.

From a neurobiological perspective, music listening engages complex neural networks involved in emotion, memory, and attention. It is known to stimulate the release of dopamine and endorphins, neurotransmitters associated with pleasure and pain relief, while potentially reducing the levels of cortisol, a primary stress hormone (16). This neurochemical shift can promote relaxation and improve focus.

Furthermore, music may act through the mechanism of *attention diversion* or *distraction* (17). By absorbing cognitive capacity and providing a competing focus, music can divert attention away from anxiety-provoking

thoughts related to the simulation scenario and performance evaluation. This can prevent the cognitive overload that often impairs performance under pressure.

In the context of Bandura's self-efficacy theory (5), while music may not directly alter deeply held self-beliefs in a single session, by reducing anxiety and facilitating better performance, it can provide a source of *mastery experience*—the most powerful source of self-efficacy information. Repeated positive experiences in simulations with music could, over time, contribute to building stronger self-efficacy among nursing students.

Review of Key Evidence

A critical examination of a randomized controlled trial (RCT) investigating this phenomenon in an Asian context provides compelling evidence. The study involved 38 baccalaureate nursing students randomly assigned to either an experimental group that listened to music during simulation testing or a control group that did not (18).

The findings were telling. The experimental group demonstrated statistically significant reductions in physiological markers of anxiety, including lower heart rates and mean arterial pressures, alongside lower scores on the State-Trait Anxiety Scale. The effect size ($\eta^2 = 0.27$) indicated a substantial practical significance. Crucially, this physiological and subjective calm translated into superior performance; instructor evaluations of clinical performance were significantly higher in the music group.

This aligns with a broader body of literature. A systematic review by Jespersen et al. (19) on music for anxiety reduction in clinical settings found consistent evidence for its calming effects. Similarly, studies on healthcare professionals and students have shown that background music can reduce stress and improve concentration during complex tasks (20, 21).

However, the Asian RCT, consistent with some other studies, found no significant impact on self-efficacy ratings (18). This suggests a nuanced relationship; while music can effectively manage the *state* of anxiety and its immediate performance consequences, it may not directly or immediately influence the more stable *trait* of self-efficacy. Building self-efficacy likely requires more sustained interventions that incorporate feedback, modeling, and repeated success, of which music may be one facilitative component.

Discussion

This review synthesizes evidence on the efficacy of music interventions in nursing simulation environments, with particular attention to findings from an Asian educational context. The convergence of results

across multiple studies presents a compelling narrative: music serves as a powerful, non-pharmacological intervention that significantly reduces both subjective and physiological indicators of anxiety while concurrently enhancing clinical performance in simulation settings.

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The most robust findings concern music's impact on physiological stress markers. The significant reductions in heart rate and mean arterial pressure observed in the primary Asian RCT (18) align well with established literature on music's autonomic nervous system effects. This physiological calming likely occurs through multiple pathways: the entrainment of cardiovascular rhythms to musical tempo, the modulation of stress hormone release, and the activation of parasympathetic nervous system activity (11, 16). From an educational perspective, this physiological stabilization is crucial because it creates the optimal conditions for cognitive processing and skill execution—conditions often compromised by anxiety-induced sympathetic arousal.

The translation of reduced anxiety into improved clinical performance, as evidenced by superior instructor evaluations in the music intervention group (18), represents perhaps the most educationally significant finding. This performance enhancement likely stems from the cognitive benefits of lowered anxiety. High anxiety consumes working memory resources through worry and intrusive thoughts, leaving fewer cognitive resources available for clinical reasoning, decision-making, and procedural execution (22). By reducing this cognitive load, music may free up mental capacity that students can then direct toward the clinical task at hand. This mechanism aligns with cognitive load theory and suggests that music's benefits extend beyond mere comfort to directly facilitating learning and skill demonstration.

The consistent null finding regarding self-efficacy across multiple studies, including the Asian RCT (18), warrants careful interpretation. This suggests that while music effectively manages the transient state of anxiety, it may not directly influence the more stable, trait-like construct of self-efficacy through brief interventions. Self-efficacy develops through mastery experiences, vicarious learning, verbal persuasion, and physiological/affective states (5). Music primarily addresses only the last component. However, an alternative interpretation is that by enabling better performance (mastery experiences) and reducing negative physiological states, music might indirectly contribute to self-efficacy development over time through repeated simulation exposures. This potential delayed effect merits longitudinal investigation.

The successful application of music intervention in an Asian context (18) holds particular significance. Asian educational environments often emphasize high-

stakes evaluation and academic achievement, potentially exacerbating simulation anxiety (8). That music demonstrated efficacy in this context suggests its benefits may be robust across cultural and pedagogical differences. However, cultural considerations regarding music preference and acceptability remain important. The use of Western classical music in the reviewed Asian study (18) raises questions about whether culturally specific music might yield even stronger effects through enhanced familiarity and emotional resonance.

Several practical implications emerge from these findings. First, the low-cost, non-invasive nature of music intervention makes it highly feasible for widespread implementation. Nursing programs can incorporate calming, instrumental music during pre-briefing sessions and throughout simulations with minimal resource allocation. Second, the intervention appears to benefit students regardless of their initial anxiety levels, suggesting value as a universal rather than targeted strategy. Third, the improvement in instructor-rated performance suggests that music might help students demonstrate their true capabilities more accurately, leading to more valid assessment.

Limitations and Research Directions

While the evidence is promising, several limitations in the existing literature warrant acknowledgment. Most studies, including the primary Asian RCT (18), feature relatively small sample sizes, limiting statistical power and generalizability. The diversity in music selection across studies—varying in genre, tempo, and structural complexity—makes it difficult to determine optimal parameters for anxiety reduction. Additionally, most research has examined only immediate effects, leaving open questions about long-term benefits and the potential for habituation with repeated exposure.

Future research should address these gaps through:

1. Larger, multi-site trials to enhance statistical power and generalizability
2. Comparative studies of different music genres, tempos, and structural elements to identify optimal parameters
3. Investigation of individual difference factors (e.g., musical training, personality traits, cultural background) that might moderate intervention effectiveness
4. Longitudinal designs examining whether simulation benefits translate to improved clinical performance in actual healthcare settings
5. Exploration of neural mechanisms through neuroimaging to better understand music's cognitive and emotional effects in learning contexts
6. Cost-benefit analyses of implementation across diverse educational settings

Conclusion

The accumulated evidence strongly supports the integration of music as an evidence-based intervention in nursing simulation education. Its dual benefit of reducing anxiety while enhancing performance, demonstrated across cultural contexts including Asian educational settings, positions music as a simple yet powerful tool for optimizing simulation-based learning. By creating a more physiologically and psychologically

supportive environment, music enables nursing students to focus cognitive resources on clinical learning and skill demonstration rather than anxiety management. As nursing education continues to evolve toward more humanistic and effective pedagogical approaches, music intervention represents a practical, cost-effective strategy that aligns with both educational excellence and student well-being.

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