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Influence of Music Listening as a Non-Pharmacological Treatment for Pain Management in the Inpatient Unit of Hospital Nacional Guido Valadares (Hngv), Dili, Timor-Leste, 2025

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ABSTRACT

Background: Pain is common among hospitalised patients, and access to analgesics is limited in resource limited hospitals. Music listening is a low cost non-pharmacological option, but no local evidence exists from Timor-Leste.

Objective: To examine the short-term change in pain intensity after a single music listening session among inpatients at Hospital Nacional Guido Valadares (HNGV), Dili, Timor-Leste.

Methods: A quasi-experimental one-group pre-test/post-test design without a control group was employed. A purposive sample of 18 inpatients with baseline pain of NRS ≥ 4 was enrolled from the HNGV inpatient unit during 10–17 November 2025. Pain intensity was measured using the Numeric Rating Scale (NRS 0–10) before and immediately after a 20–30-minute session of instrumental classical or slow-tempo music selected by patient preference. The Wilcoxon Signed-Rank Test was applied for statistical comparison ($\alpha = 0.05$).

Results: Median NRS decreased from 7 (interquartile range [IQR] 6–7.75) to 3 (IQR 2–3) (mean 6.72 to 2.89; Hodges–Lehmann median difference 4.0, 95% CI 3.5–4.5). Seventeen of 18 participants showed a reduction in NRS score (all by ≥ 2 points and ≥ 30%), with one participant showing no change. The Wilcoxon Signed-Rank Test confirmed a statistically significant reduction ($Z = -3.67$; $p < 0.001$; $r = 0.86$). No participant remained in the severe pain category.

Conclusion: A single music listening session was associated with a short-term, within-session reduction in self-reported pain intensity. Causality cannot be inferred without a control group, blinding, and recorded analgesic timing; a randomised controlled trial is the next step.

INTRODUCTION

Pain is a universal, multidimensional clinical problem that significantly impairs patients' quality of life, functional capacity, and psychological well-being. Defined by the International Association for the Study of Pain (IASP) as 'an unpleasant sensory and emotional

experience associated with, or resembling that associated with, actual or potential tissue damage' (Raja et al., 2020), pain manifests in acute forms (onset sudden, duration < 3 months) and chronic forms (duration ≥ 3 months) (Treede et al., 2019), each carrying distinct clinical implications. Chronic pain is highly prevalent worldwide and generates substantial economic burden through healthcare expenditure and lost productivity, alongside psychosocial consequences including depression, anxiety, and sleep disturbance (Cohen et al., 2021).

At the regional level, population surveys across 52 countries show marked differences in pain prevalence between countries (Zimmer et al., 2022), and among 3,255 Indonesian adults chronic pain was associated with poorer subjective health (Weraman et al., 2024). Poorly controlled postoperative pain also remains common worldwide and is linked to adverse outcomes (Gan, 2017). In Timor-Leste, systematic epidemiological data on chronic pain prevalence are currently unavailable; however, a hospital survey of 200 patients found that 60% had ever used traditional medicine and that 45% of users did so to relieve pain (Grace et al., 2020), which suggests a need for accessible and acceptable pain relief. At HNGV, hospital level indicators such as analgesic stock-outs and nurse workload were not collected in this study; documenting them is recommended to show the urgency of low cost adjunct pain strategies.

The recognition of these limitations has catalysed growing interest in non-pharmacological pain management strategies. Among these, music based interventions have attracted sustained scientific attention for their safety and low cost. Two broad categories are distinguished: music therapy, in which a credentialled music therapist delivers individualised interventions within a therapeutic relationship, and music medicine, in which pre-recorded music is offered for listening by health care staff without a therapist (Bradt et al., 2021). Music therapy is formally defined as the intentional, evidence-based use of musical interventions by a credentialled practitioner to address physical, emotional, cognitive, and social needs (Bradt et al., 2021). Because the intervention evaluated here was recorded music delivered through headphones by the nursing researcher, it is classified in this article as music listening (music medicine) and not as music therapy; the term music therapy is retained only when citing studies that used it. Its analgesic mechanism is not fully established; proposed pathways include modulation of attention, emotion, and reward and of descending pain inhibitory systems, but these were not measured in this study and are treated here as hypotheses (Garza-Villarreal et al., 2017; Lunde et al., 2019).

An extensive evidence base supports the use of music based interventions for pain. Meta-analyses of randomised trials have reported pain reductions with music across clinical populations (Lee, 2016), in surgical patients (Kühlmann et al., 2018), after cardiac surgery (Kakar et al., 2021), and in chronic pain conditions (Garza-Villarreal et al., 2017). However, effects are heterogeneous, and the certainty of this evidence is limited by methodological weaknesses in many trials (Bradt et al., 2021).

Notwithstanding this international evidence base, music listening has not been systematically integrated into nursing practice in Timor-Leste, and no prior study has examined its feasibility or effectiveness in the local hospital context. In neighbouring Southeast Asian settings, trials of locally familiar music have reported lower pain scores, for example Thai traditional music after abdominal surgery (Phosida et al., 2016) and classical music or murottal recitation after orthopaedic surgery in Indonesia (Prihatno et al., 2025), but we are not aware

of comparable work in Timor-Leste. This gap is particularly pertinent given Timor-Leste's vibrant musical culture, which may enhance both patient acceptability and therapeutic response. The present study was therefore designed to evaluate the short-term change in pain intensity after a structured music listening session among inpatients at Hospital Nacional Guido Valadares (HNGV), the country's foremost national referral hospital, with a view to generating locally relevant evidence to inform clinical nursing policy. The novelty of the study is therefore not a new test of whether music can relieve pain, but the first report of the feasibility and short-term pain outcomes of nurse delivered music listening in a low resource tertiary hospital in Timor-Leste.

Research Objectives

The primary objective was to determine the change in pain intensity associated with a music listening intervention in HNGV inpatients. Specific objectives were: (1) to assess baseline (pre-intervention) pain intensity; (2) to assess post-intervention pain intensity following a single music listening session; (3) to analyse the statistical significance of the pre-post difference in pain scores; and (4) to describe the proportion of participants reaching a clinically meaningful reduction. The findings are expected to benefit nurses (a simple bedside option for pain relief), hospital management (a low cost adjunct and a basis for a local protocol), and nursing education (content on non-pharmacological pain management).

LITERATURE REVIEW

Pain: Definition, Classification, and Physiological Mechanisms

Pain is conceptualised as a complex biopsychosocial phenomenon encompassing sensory, emotional, and cognitive dimensions. The IASP's revised definition (Raja et al., 2020) explicitly acknowledges that pain experience is inherently subjective and context-dependent, shaped by prior experience, cultural norms, and psychological state. The physiological process of pain transmission proceeds through four sequential stages: (1) transduction, whereby noxious thermal, mechanical, or chemical stimuli are converted to electrical impulses at peripheral nociceptors; (2) transmission, involving propagation via myelinated A-delta fibres (sharp, localised, rapid pain) and unmyelinated C fibres (diffuse, persistent pain) to the dorsal horn of the spinal cord; (3) perception, entailing conscious awareness at the somatosensory cortex and limbic system; and (4) modulation, encompassing descending inhibitory pathways from the brainstem that release endogenous opioids (endorphins, enkephalins) to attenuate pain signals (Yam et al., 2018). Key neuromodulators include substance P (excitatory neurotransmitter facilitating pain transmission), endorphins (inhibitory neuromodulators reducing pain perception), and prostaglandins (peripheral sensitisers lowering nociceptor thresholds).

Pain experience is modulated by multiple factors including prior pain history, age, cultural background, anxiety, environmental context, and psychological distress. Anxiety and pain maintain a bidirectional reinforcing relationship, whereby uncontrolled pain elevates anxiety, which in turn intensifies pain perception and depletes coping resources, a cycle that relaxation-based interventions are well positioned to interrupt (Cohen et al., 2021).

Music Interventions: Mechanisms, Types, and Clinical Protocol

Music based interventions are broadly categorised into active modalities (singing, instrumental performance, improvisation, songwriting) and receptive modalities (structured listening). In clinical settings, receptive music listening is most widely implemented due to minimal resource requirements and ease of delivery at the bedside (Bradt et al., 2021). Several mechanisms have been proposed for music induced analgesia, including modulation of attention, emotion, and reward networks, activation of descending pain inhibitory pathways, and reduced autonomic arousal. Evidence for these pathways comes mainly from experimental and imaging studies, and none of them was measured in the present study (Garza-Villarreal et al., 2017; Lunde et al., 2019).

In clinical practice, slow-tempo instrumental music with a steady rhythm is commonly chosen for relaxation oriented listening, whereas self-chosen music may produce stronger analgesic responses than researcher-selected music in experimental pain (Valevicius et al., 2023). Sessions of about 20–30 minutes are commonly used in bedside listening protocols, although the optimal tempo, genre, and duration have not been established.

Evidence Base for Music Interventions in Pain Management

As summarised in the Introduction, meta-analyses of randomised trials support the analgesic effect of music listening (Garza-Villarreal et al., 2017; Kakar et al., 2021; Kühlmann et al., 2018; Lee, 2016). Findings are not uniformly positive, however. Effects vary between populations and designs, and many trials have methodological limitations (Bradt et al., 2021).

Pain Assessment: The Numeric Rating Scale

Valid and reliable pain quantification is a prerequisite for evidence-based pain management. The Numeric Rating Scale (NRS) is among the most extensively validated unidimensional pain measures, requiring patients to self-report pain intensity on an 11-point integer scale (0 = no pain; 10 = worst imaginable pain). In this study, NRS scores were operationally categorised as: 0 = no pain; 1–3 = mild; 4–6 = moderate; 7–10 = severe. Cut-off points for mild, moderate, and severe pain vary between samples (Boonstra et al., 2016), so the categories above are used here as operational definitions only. The NRS has demonstrated strong construct validity, test-retest reliability, and responsiveness to intervention-related change in diverse adult patient populations, making it the most appropriate instrument for this clinical context (Karcioglu et al., 2018).

METHOD

Study Design

This study employed a quantitative quasi-experimental one-group pre-test/post-test design. A single group design without a control group was used because this was a small, time limited feasibility study conducted by one researcher within eight days. A usual care, attention control, or crossover comparison would have been feasible, and the absence of a control group is a major limitation. The design enabled paired within-subject comparison of pain intensity before and after the music listening intervention. The design cannot separate the effect of music from the effects of time, expectation, attention from the researcher, and concurrent analgesia.

Study Setting and Data Collection Period

The study was conducted in the inpatient unit of Hospital Nacional Guido Valadares (HNGV), Timor-Leste's principal national referral hospital, located in Bidau Santana sub-district, Cristo Rei Administrative Post, Dili Municipality. HNGV serves as the country's highest-level tertiary care facility. Data collection was conducted over eight consecutive days: 10–17 November 2025. Recruitment flow (patients screened, eligible, and refusing) is summarised in Table 9.

Population, Sample, and Sampling Technique

The target population comprised all patients admitted to the HNGV inpatient unit during the study period. No a priori power calculation for a paired comparison was performed. The Federer formula applies to experiments with two or more groups and cannot be used for a single group design, because with t = 1 the left side is always 0. The sample size (n = 18) was therefore set pragmatically by the number of eligible patients who consented during the eight day data collection period. Sampling was performed using non-probability purposive sampling, selecting participants according to pre-specified eligibility criteria. A post hoc sensitivity calculation showed that, with 18 pairs, a two-tailed α of 0.05, and 80% power, a paired t-test could detect a standardised mean difference (dz) of about 0.70 or larger; the observed dz was 2.96.

Table 1. Eligibility Criteria for Study Participation

Inclusion Criteria	Exclusion Criteria
1. Adult inpatients (≥ 18 years) currently admitted to the HNGV inpatient unit	1. Refusal to participate
2. NRS pain score ≥ 4 at baseline	2. Clinically confirmed hearing impairment
3. Conscious, communicative, and able to self-report pain	3. Altered consciousness or cognitive impairment precluding pain self-report
4. Willing to participate and provided written informed consent	4. Not admitted to the HNGV inpatient unit during the study period

Intervention Protocol

The music listening intervention was delivered according to a standardised protocol developed by the research team in line with published music listening protocols (Bradt et al., 2021; Kakar et al., 2021), comprising six sequential steps: (1) confirmation of patient's auditory capacity; (2) assessment of musical preferences and prior experience; (3) selection of instrumental classical or slow-tempo music in accordance with patient preference [titles or composers, tempo in beats per minute, audio device, and volume level to be inserted by the authors]; (4) positioning the patient comfortably in bed; (5) delivery of music via personal headphones using a portable audio player for 20–30 minutes in a low-stimulation, calm ward environment; and (6) immediate post-session reassessment of pain intensity using the NRS. The same nursing researcher administered all sessions and also recorded the NRS scores, so no independent or blinded assessor was used, which may introduce measurement bias. No music therapy credential is claimed; the intervention is therefore classified as music listening (music medicine). The timing and type of concomitant analgesics were not recorded. [Actual session duration for each participant to be inserted by the authors.]

Research Variables and Operational Definitions

Table 2. Research Variables and Operational Definitions

Variable	Operational Definition	Instrument	Measurement Scale
Independent Variable: Music Listening	Music listening: listening to instrumental classical or slow-tempo music selected according to patient preference via headphones for 20–30 minutes at the bedside. Applied once per session.	Portable audio player, headphones, structured session checklist	Administered / Not administered (dichotomous)
Dependent Variable: Pain Intensity	Patient-reported pain intensity on the NRS (0–10) at two time points: immediately before (pre-test) and immediately after (post-test) the music listening session.	Numeric Rating Scale (NRS 0–10)	Ordinal: 0 = No pain, 1–3 = Mild, 4–6 = Moderate, 7–10 = Severe

Statistical Analysis

Univariate analysis using frequency distributions and percentages was performed for all demographic and pain variables. Bivariate analysis employed the Wilcoxon Signed-Rank Test to compare paired pre- and post-intervention NRS scores, given the ordinal measurement scale and small sample size (n = 18). NRS scores are summarised as median (interquartile range, IQR) and as mean ± standard deviation. The Hodges–Lehmann median difference with an exact 95% confidence interval and the effect size $r = |Z|/\sqrt{N}$ (N = 18 pairs) were calculated from the individual data in Table 7 using Python (SciPy), with the tie-corrected normal approximation for Z. A clinically meaningful reduction was defined as a decrease of ≥ 2 points or ≥ 30% from baseline (Olsen et al., 2017), and the number of participants reaching this threshold was counted. Statistical significance was set at $\alpha = 0.05$ (two-tailed). All analyses were performed using IBM SPSS Statistics version 25.

Ethical Considerations

Ethical clearance was obtained from the Instituto Nacional de Saúde Timor-Leste (INS) (approval reference no. [to be inserted by the authors], dated [date to be inserted]) and permission to collect data at HNGV [to be confirmed by the authors]. All participants were provided a full explanation of the study's purpose, procedures, risks, and benefits before enrolment. Written informed consent was obtained from every participant. Anonymity was ensured by replacing participant identifiers with numerical codes in all datasets and outputs. Confidentiality of all data was maintained in accordance with institutional research ethics standards. Participation was entirely voluntary; participants were free to withdraw at any stage without negative consequences for their clinical care.

RESULTS AND DISCUSSION

Profile of Hospital Nacional Guido Valadares (HNGV)

As of 2025, HNGV employs a total workforce of 900 health professionals across multiple disciplines (Table 3). The nursing workforce (n = 333; 37.0%) is the largest professional group and is the cadre that would deliver a bedside music listening intervention, which is why staff composition is reported.

Table 3. Human Resource Distribution, HNGV (2025)

No.	Profession / Category	n	%
1	Specialist Physicians	66	7.3
2	General Practitioners	193	21.4
3	Nurses	333	37.0
4	Midwives	87	9.7
5	Laboratory Analysts	25	2.8
6	Pharmacists	29	3.2
7	Physiotherapists	15	1.7
8	Radiographers	19	2.1
9	Nutritionists	8	0.9
10	Other Allied Health Staff	125	13.9
Total		**900**	**100.0**

Source: HNGV Department of Human Resources, 2025

Demographic Characteristics of Participants

Eighteen participants were recruited. The sample was predominantly female (61.1%, n = 11). The largest age group was 61–78 years (50.0%, n = 9), consistent with the predominance of older adults among chronic pain patients. Most participants were married (83.3%, n = 15). Regarding educational attainment, 44.4% (n = 8) had received no formal schooling. The majority were unemployed (61.1%, n = 11). Full demographic distributions are presented in Table 4.

Table 4. Demographic Characteristics of Study Participants (N = 18)

Characteristic	n	%
Sex		
Female	11	61.1
Male	7	38.9
Age Group (years)		
18–40	4	22.2
41–60	5	27.8
61–78	9	50.0
Marital Status		
Single	3	16.7
Married	15	83.3
Educational Level		
No formal schooling	8	44.4
Primary	3	16.7
Pre-secondary	3	16.7
Secondary	2	11.1
University	2	11.1
Occupation		
Unemployed	11	61.1

Student	4	22.2
Employed	3	16.7

Source: Primary data, 2025

Pre-Intervention Pain Intensity

At baseline, no participant reported mild or no pain. Moderate pain (NRS 4–6) was present in 44.4% (n = 8) and severe pain (NRS 7–10) in 55.6% (n = 10), confirming that all enrolled participants carried a clinically significant pain burden warranting intervention (Table 5).

Table 5. Pre-Intervention Pain Intensity Distribution (N = 18)

Pain Category (NRS)	n	%
Moderate pain (NRS 4–6)	8	44.4
Severe pain (NRS 7–10)	10	55.6
Total	**18**	**100.0**

Source: Primary data, 2025

Post-Intervention Pain Intensity

Following the music listening session, 17 of 18 participants demonstrated a reduction in NRS score; one participant (No. 1, pre-NRS = 4) showed no change. The distribution shifted markedly: no participant remained in the severe pain category post-intervention, the proportion reporting moderate pain decreased from 44.4% (n = 8) to 22.2% (n = 4), and 77.8% (n = 14) improved to the mild pain category (NRS 1–3). No participant reported an increase in pain intensity following the intervention (Table 6).

Table 6. Post-Intervention Pain Intensity Distribution (N = 18)

Pain Category (NRS)	n	%
Mild pain (NRS 1–3)	14	77.8
Moderate pain (NRS 4–6)	4	22.2
Total	**18**	**100.0**

Source: Primary data, 2025

Comparative Pre-Post Pain Scores: Individual Participant Data

Table 7 presents individual-level NRS scores before and after music listening for all 18 participants, enabling transparency and reproducibility. Seventeen of 18 participants recorded a numerically lower pain score post-intervention. One participant (No. 1, aged 28 years) recorded identical NRS scores (4) before and after the intervention, constituting a tie in the Wilcoxon analysis. No participant recorded a higher pain score post-intervention. Reductions ranged from 3 to 6 points (3 points, n = 5; 4 points, n = 7; 5 points, n = 4; 6 points, n = 1).

Table 7. *Individual Pre- and Post-Intervention NRS Pain Scores (N = 18)*

No.	Age	Sex	Marital	Education	Occupation	Pre NRS	Pre Cat.	Post NRS	Post Cat.
1	28	M	Single	University	Student	4	Moderate	4	Moderate

2	47	F	Married	Pre-secondary	Unemployed	7	Severe	3	Mild
3	60	F	Married	Pre-secondary	Unemployed	6	Moderate	2	Mild
4	78	F	Married	None	Unemployed	6	Moderate	3	Mild
5	52	F	Married	None	Unemployed	7	Severe	3	Mild
6	76	M	Married	None	Unemployed	8	Severe	3	Mild
7	18	M	Single	Secondary	Student	6	Moderate	2	Mild
8	75	F	Married	None	Unemployed	8	Severe	3	Mild
9	59	F	Married	None	Unemployed	7	Severe	4	Moderate
10	59	M	Married	Pre-secondary	Employed	8	Severe	3	Mild
11	23	F	Single	University	Student	8	Severe	4	Moderate
12	37	M	Married	Secondary	Employed	6	Moderate	2	Mild
13	65	F	Married	None	Unemployed	7	Severe	2	Mild
14	70	M	Married	None	Unemployed	6	Moderate	3	Mild
15	70	F	Married	Primary	Employed	6	Moderate	2	Mild
16	65	F	Married	Primary	Unemployed	7	Severe	4	Moderate
17	63	M	Married	Primary	Student	5	Moderate	2	Mild
18	75	F	Married	None	Unemployed	9	Severe	3	Mild

Note. Occupation is shown as recorded in the source data; participant No. 17 (63 years) is recorded as a student and should be verified by the authors. Pain diagnosis and length of stay are not available in the analysed dataset.

Source: Primary data, 2025

Bivariate Analysis: Wilcoxon Signed-Rank Test

The Wilcoxon Signed-Rank Test was applied to the paired pre- and post-test NRS scores. As shown in Table 8, 17 participants exhibited a reduction in pain score (17 negative ranks; 0 positive ranks; 1 tie). One participant (No. 1) recorded identical pre- and post-test scores (NRS = 4) and was excluded from rank calculation per standard Wilcoxon procedure. The test yielded $Z = -3.67$ (based on positive ranks) with an asymptotic two-tailed significance of $p < 0.001$, well below the predetermined threshold of $\alpha = 0.05$. The null hypothesis (H_0: pain intensity does not differ between the pre-test and the post-test) was consequently rejected, and the alternative hypothesis (H_1: pain intensity differs between the pre-test and the post-test) was accepted. The previously reported rank sum (171.00), mean rank (9.50), and Z (–3.621) were inconsistent with 17 ranks and were corrected: with 17 non-zero differences the rank sum is 153.00 (mean rank 9.00), and the tie-corrected Z recalculated from Table 7 is –3.67.

Table 8. Wilcoxon Signed-Rank Test: Pre-Test vs. Post-Test NRS Pain Scores

Rank Category	N	Mean Rank	Sum of Ranks	p-value
Negative Ranks (Post-test < Pre-test)	17[a]	9.00	153.00	< 0.001
Positive Ranks (Post-test > Pre-test)	0[b]	0.00	0.00	—
Ties (Post-test = Pre-test)	1[c]	—	—	—
Z = –3.67[d] | p < 0.001 | Decision: Reject H_0; accept H_1				

[a] Post-test < Pre-test | [b] Post-test > Pre-test | [c] Post-test = Pre-test | [d] Based on positive ranks.
Source: SPSS output, primary data, 2025

Participant Flow

Participant flow is shown in Table 9. Eighteen patients were enrolled and all 18 were analysed (17 non-zero differences and 1 tie). The numbers screened, eligible, and refusing participation are to be completed by the authors from the screening records.

Table 9. Participant Flow

Stage	n	Note
Patients screened	[n]	[to be inserted by the authors]
Patients eligible	[n]	[to be inserted by the authors]
Patients refusing or excluded	[n]	[to be inserted by the authors]
Enrolled and received the music listening session	18	Table 4
Analysed with the Wilcoxon test	18	17 non-zero differences, 1 tie

Source: Primary data, 2025

Descriptive Statistics, Effect Size, and Clinical Relevance

Descriptive statistics, the Hodges–Lehmann estimate, and the effect size are shown in Table 10. The median NRS fell from 7 (IQR 6–7.75) to 3 (IQR 2–3), and the mean fell from 6.72 to 2.89. The Hodges–Lehmann median difference was 4.0 points (95% CI 3.5–4.5), and the effect size was large (r = 0.86). Seventeen of 18 participants (94.4%) achieved a reduction of at least 2 points and at least 30%, whereas the remaining participant (No. 1) showed no change.

Table 10. Descriptive Statistics, Effect Size, and Clinical Relevance of NRS Pain Scores (N = 18)

Measure	Pre-test	Post-test
Median (IQR)	7 (6–7.75)	3 (2–3)
Mean ± SD	6.72 ± 1.23	2.89 ± 0.76
Minimum to maximum	4–9	2–4
Reduction in NRS, median (range)	4 (0–6)	
Hodges–Lehmann median difference (95% CI)	4.0 (3.5–4.5)	
Effect size r = $\|Z\|/\sqrt{N}$	0.86	
Reduction ≥ 2 points, n/N (%)	17/18 (94.4%)	
Reduction ≥ 30%, n/N (%)	17/18 (94.4%)	

Note. IQR = interquartile range. The Hodges–Lehmann estimate and exact 95% CI are based on the 17 non-zero differences; r = $|Z|/\sqrt{N}$ with Z = –3.67 and N = 18 pairs. Source: Primary data, 2025

Discussion

Interpretation of Pre-Intervention Pain Burden

The baseline finding that all 18 participants presented with at least moderate pain (NRS ≥ 4), and that more than half (55.6%) reported severe pain (NRS 7–10), may reflect unmet analgesic need among HNGV inpatients, although analgesic use was not recorded. This profile is consistent with international studies demonstrating that moderate-to-severe pain is the predominant symptom burden in acute hospital settings, particularly where pharmacological analgesic access is constrained (Cohen et al., 2021; Gan, 2017). In the Timorese healthcare

context, where consistent analgesic supply remains challenging in many districts, non-pharmacological adjuncts assume heightened clinical relevance.

Effect of Music Listening on Pain Intensity

Following a single 20–30-minute session of instrumental classical or slow-tempo music, 17 of 18 participants demonstrated a measurable reduction in NRS pain score, with one participant showing no change; no participant experienced worsening pain. The Wilcoxon Signed-Rank Test confirmed this reduction to be statistically significant ($Z = –3.67$; $p < 0.001$; $r = 0.86$). The shift in pain category distribution (from 55.6% severe and 44.4% moderate at pre-test to 0% severe, 22.2% moderate, and 77.8% mild at post-test) was accompanied by a reduction of at least 2 points and at least 30% in 17 of 18 participants (94.4%), which exceeds the minimum clinically important differences commonly reported for acute pain (about 1.7 points or 22%) (Olsen et al., 2017). The median reduction was 4 points (Hodges–Lehmann estimate 4.0; 95% CI 3.5–4.5; Table 10).

These findings are compatible with proposed mechanisms of music induced analgesia, such as modulation of attention, emotion, and descending pain inhibition (Garza-Villarreal et al., 2017; Lunde et al., 2019). However, no physiological variable (for example endorphins, cortisol, catecholamines, heart rate, blood pressure, or brain activity) was measured here, so these mechanisms remain hypotheses. In an Indonesian randomised trial, classical music and murottal recitation lowered pain scores without lowering interleukin 6 (Prihatno et al., 2025), which shows that reported pain relief need not reflect a measurable biological change.

Alternative Explanations

Several alternative explanations must be considered before any part of the observed reduction is attributed to music. First, regression to the mean is likely because only patients with NRS ≥ 4 were enrolled and pain naturally fluctuates. Second, the same researcher delivered the session and recorded the NRS immediately afterwards, so expectation effects, social desirability, and the attention received during the session may have lowered reported scores. Third, the timing and type of concurrent analgesics were not recorded, so analgesic effects cannot be excluded. Fourth, the passage of time and rest during the 20 to 30 minutes of the session may reduce pain without any contribution from music. Systematic reviews also note heterogeneity and limited certainty of the evidence (Bradt et al., 2021), so the present within session change should not be read as a causal effect.

Comparison with Previous Research

The direction of the present finding agrees with meta-analyses of randomised trials of music listening (Kakar et al., 2021; Kühlmann et al., 2018; Lee, 2016) and with recent trials from Southeast Asia, including Thai traditional music after abdominal surgery (Phosida et al., 2016) and classical music or murottal recitation after orthopaedic surgery in Indonesia (Prihatno et al., 2025). Because the present study had no control group, its pre-post change (median 4 points) cannot be compared directly with between group effects in randomised trials and probably overestimates the effect of music alone.

Contextual and Cultural Considerations

The study population's demographic profile, predominantly elderly (50% aged 61–78 years), female (61.1%), and with low formal educational attainment (44.4% with no schooling), underscores the particular value of music listening as a non-verbal, non-pharmacological intervention that requires no literacy, technical knowledge, or complex patient compliance. Timor-Leste has a rich musical heritage that includes traditional ceremonies, communal singing, and spiritual practices, but the music used here was instrumental classical (Western) or slow-tempo music, so this heritage formed no part of the intervention and any cultural benefit is speculative. Culturally familiar or patient-chosen music, such as traditional Timorese songs, may be more acceptable and more effective (Phosida et al., 2016; Valevicius et al., 2023), and should be tested in future studies, ideally in a randomised comparison with Western classical music, together with qualitative investigation of patient preferences.

Limitations

This study has several limitations that should be considered when interpreting findings. First, the quasi-experimental single-group design without a concurrent control group limits causal inference; observed pain reductions cannot be definitively attributed to music listening alone, as regression to the mean, natural pain fluctuation, and concurrent analgesic administration may have contributed. A randomised controlled trial with an active or attention-matched control group would provide stronger causal evidence (Hariton & Locascio, 2018). Second, the sample size of 18 was set pragmatically without an a priori power calculation, is modest, and constrains the statistical power and generalisability of findings. Third, post-intervention pain was assessed immediately after the session; no follow-up data were collected to determine the duration of the analgesic effect. Fourth, all data were collected at a single tertiary centre (HNGV), limiting external validity to community hospitals and primary care settings. Fifth, potential confounders, including concurrent pharmacological analgesia, time since last analgesic dose, specific pain diagnosis, and co-morbidities, were not systematically controlled. In particular, the timing and type of concomitant analgesic medications received by participants during the study period were not recorded, which represents a significant limitation for causal inference. Sixth, the same researcher delivered the intervention and recorded the outcome without blinding or an independent assessor, so expectation and social desirability effects are likely. Seventh, only patients with NRS ≥ 4 were enrolled, which makes regression to the mean likely, and pain diagnosis and length of stay are not available in the analysed dataset. Eighth, the music was Western classical or slow-tempo music rather than Timorese music. The findings should therefore be read as an observed short-term association and not as an effect of music. Future research should address these limitations through appropriately powered RCT designs, multi-centre sampling, extended follow-up periods, and comprehensive covariate adjustment, independent blinded outcome assessment, and culturally familiar music options.

CONCLUSION

In this single group pre-test/post-test study, a single 20–30-minute music listening session (instrumental classical or slow-tempo music) was associated with a short-term reduction in self-reported pain intensity among inpatients at Hospital Nacional Guido Valadares, Timor-Leste (median NRS 7 to 3; $Z = –3.67$; $p < 0.001$; $r = 0.86$). After the session, no participant remained in the severe pain category and 77.8% ($n = 14$) reported mild pain (NRS 1–3).

These findings suggest that music listening was feasible to deliver as a low resource adjunct to routine analgesia in this setting. They do not establish causality, cost-effectiveness, or cultural appropriateness, none of which was evaluated. Nurses can deliver music listening after brief protocol training, but it should not be described as music therapy unless it is delivered by a credentialled practitioner. The main next step is a randomised controlled trial with a usual care or attention control comparison, independent blinded outcome assessment, recorded analgesic timing, a larger and more diverse sample, and culturally familiar music options.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. This study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization, methodology, investigation, data curation, formal analysis, and writing of the original draft: Muhamad Syarifudin. Supervision, validation, and writing (review and editing): Jaimito Manuel Ferreira and Antonia Soares. All authors approved the final manuscript. [Roles to be confirmed by the authors.]

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The author(s) declared that generative AI was used in the creation of this manuscript. The author(s) wish to acknowledge the use of Generative AI for refining the language clarity and grammatical structure of this manuscript. This application was conducted in adherence to established ethical guidelines regarding the use and disclosure of generative AI in scholarly research. Each author has provided substantial intellectual contributions to the work, which has been rigorously vetted for accuracy, and the author(s) assume full responsibility for the integrity and final content of the manuscript.

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