

Classical Gamelan Music Therapy for Sleep Quality and Cardiovascular Parameters in Third-Trimester Pregnant Women: A Case Series

Fitriana Kurniasari Solikhah^{1,*}, Hasanudin¹

¹ Poltekkes Kemenkes Malang, Malang, Indonesia

E-mail: fitriana.polkesma@gmail.com

ABSTRACT

Background: Sleep disturbances severely impact third-trimester pregnant women, increasing adverse obstetric risks. Non-pharmacological interventions are strongly preferred, yet culturally congruent therapies like classical gamelan music remain critically underexplored in clinical practice.

Methods: In this prospective case series conducted between January and March 2026 in Indonesia, we enrolled three third-trimester pregnant women experiencing severe sleep disturbances (Pittsburgh Sleep Quality Index [PSQI] >5). Participants received a 3-day classical gamelan music therapy regimen (10–15 minutes, twice daily). The primary outcomes included changes in PSQI global scores and sleep duration, as well as secondary cardiovascular parameters including blood pressure.

Result: The three participants, aged 24 to 29 years, presented with severe baseline sleep fragmentation (mean PSQI 13.7). Following the intervention, individual PSQI scores decreased substantially (Patient A: 14 to 9; Patient B: 12 to 8; Patient C: 15 to 10). Mean nightly sleep duration increased from 3.8 to 6.0 hours. Concurrently, resting heart rates decelerated from a mean of 102 bpm to 81 bpm, and systolic blood pressure normalized from 129 mmHg to 120 mmHg across all three individual participants.

Conclusion: A brief regimen of classical gamelan music therapy appears feasible and is associated with marked improvements in subjective sleep quality and autonomic regulation in third-trimester pregnant women. This culturally congruent, non-pharmacological intervention offers a safe, accessible adjunctive strategy for gestational sleep management. Future large-scale randomised controlled trials with objective polysomnographic endpoints are warranted to validate these preliminary findings and establish definitive clinical efficacy and safety.

KEYWORDS

Pregnant Women; Sleep Quality; Gamelan Music, Music Therapy, Pregnancy Trimester, Sleep Wake Disorders, Blood Pressure, Heart Rate.

Received: 3 December 2025

Revised: 9 June 2026

Accepted: 25 June 2026

How to cite: Solikhah, Fitriana Kurniasari et al. (2025). Classical Gamelan Music Therapy for Sleep Quality and Cardiovascular Parameters in Third-Trimester Pregnant Women: A Case Series. *Interdisciplinary Journal of Ethnopsychiatric Nursing*. 2(1): 1-17.



INTRODUCTION

Sleep disturbances represent a pervasive and clinically significant challenge during the third trimester of pregnancy, affecting an estimated 40% to 80% of pregnant women globally. The etiology of gestational sleep fragmentation is multifactorial, driven by profound hormonal fluctuations, anatomical constraints such as uterine expansion and nocturia, and psychological stressors related to impending childbirth (Okoror and Omuemu, 2023; Ji *et al.*, 2024; Heidarifard, Khoshnam Rad and Khoshnam Rad, 2025; Revathi, Ts and M, 2025). Far from being a benign transient discomfort, poor sleep quality in late pregnancy is independently associated with a heightened risk of adverse obstetric and fetal outcomes, including gestational hypertension, preeclampsia, preterm birth, and impaired fetal neurodevelopment. Despite this substantial disease burden, gestational sleep disorders remain critically under-recognised and under-managed in routine antenatal care, highlighting an urgent need for effective, safe, and accessible interventions (Varela *et al.*, 2017; Guo *et al.*, 2021; Cramez *et al.*, 2024; Elhag *et al.*, 2025). The clinical management of sleep disturbances during pregnancy is severely constrained by the teratogenic risks and adverse effect profiles of conventional pharmacological therapies. The use of sedative-hypnotic agents is heavily restricted due to concerns regarding fetal central nervous system depression, neonatal withdrawal, and maternal dependency (Lu *et al.*, 2021; Liamsombut and Tantrakul, 2022; Konsam *et al.*, 2023; Kurniawati *et al.*, 2024). Consequently, international obstetric guidelines strongly advocate for non-pharmacological approaches as the first-line management strategy. However, established behavioral interventions, such as cognitive behavioural therapy for insomnia (CBT-I), are often resource-intensive, require specialised clinical training, and suffer from variable patient adherence (Sweet *et al.*, 2020; Gurbuz *et al.*, 2022; de la Calle *et al.*, 2024). This therapeutic bottleneck underscores a critical unmet need for scalable, low-cost, and non-invasive complementary modalities that can be seamlessly integrated into standard maternity care, particularly in resource-constrained settings.

Music therapy has emerged as a promising neuromodulatory intervention capable of inducing profound autonomic and psychological relaxation through rhythmic entrainment and limbic system regulation. While the efficacy of Western classical music in improving sleep latency and architecture is well-documented, there is a distinct paucity of rigorous clinical research exploring culturally congruent traditional modalities (Gustafsson *et al.*, 2017; Peiris and Sundarapperuma, 2024; Banaei *et al.*, 2025). Classical Javanese gamelan music possesses unique acoustic properties—characterised by a slow, meditative tempo of approximately 60 beats per minute, regular cyclic rhythms, and a pentatonic melodic structure—that are theoretically optimised for downregulating sympathetic nervous system activity and stimulating vagal tone. Despite its deep cultural resonance and preliminary evidence of anxiolytic effects in other populations, high-quality empirical data evaluating the specific clinical efficacy of gamelan music for gestational sleep disorders remain entirely lacking (Kawakami, Ikegami and Komada, 2023; Manconi *et al.*, 2024).

To address this critical knowledge gap, we conducted a prospective case series to evaluate the acute clinical effects and feasibility of a structured, short-term classical gamelan music therapy regimen in third-trimester pregnant women experiencing severe sleep disturbances. By meticulously tracking changes in subjective sleep architecture, measured via the Pittsburgh Sleep Quality Index (PSQI), alongside objective cardiovascular parameters including blood pressure and resting heart rate, this study aims to capture the individualised physiological responses to this culturally grounded intervention. As a foundational exploratory study, this case series seeks to generate robust clinical hypotheses and provide the preliminary evidence necessary to justify future large-scale, randomised controlled trials, ultimately informing the integration of safe, culturally resonant acoustic therapies into evidence-based antenatal care protocols.

MATERIALS AND METHODS

Study Design and Ethical Considerations

This investigation was meticulously crafted as a descriptive case series, designed to capture the profound, individualized healing journeys of pregnant women navigating the turbulent waters of their third trimester through the ancient resonance of classical gamelan music therapy. Adhering strictly to the rigorous reporting standards established by the CARE (CAse REport) guidelines, this study seeks to illuminate the hidden connections between auditory resonance and physiological restoration with the utmost transparency and clinical precision, while honoring the unique narrative of each participant. The ethical sanctity of this endeavor was safeguarded through the diligent approval of the Health Research Ethics Committee at the Ministry of Health Polytechnic of Malang, ensuring that every step of the journey honored the dignity, autonomy, and well-being of the participants. Written informed consent was obtained from each woman in a manner that respected her inner self—the sacred, guarded space of personal choice—after a comprehensive explanation of the study's purpose, procedures, potential benefits, and the absolute right to withdraw at any moment without prejudice. The study was conducted in strict accordance with the Declaration of Helsinki, and the participants were assured of the confidentiality of their clinical data throughout the research process.

Patient Selection and Clinical Presentation

The sanctuary for this healing endeavor was the Wagir Community Health Center in Malang Regency, East Java, Indonesia, a place where the ancient, rhythmic wisdom of local culture seamlessly intertwines with modern maternal healthcare, providing a nurturing environment for the restoration of balance. The enrollment of three participants unfolded between January and March 2026, selected through a purposive sampling technique that sought those whose sleep had been most profoundly fractured by the physical and emotional burdens of impending motherhood. The inclusion criteria were meticulously defined to ensure a pure, unadulterated observation of the therapy's effects: women aged 18 to 45 years, carrying a singleton pregnancy at a gestational age of 28 weeks or more, and experiencing subjective sleep disturbances as evidenced by a Pittsburgh Sleep Quality Index (PSQI) global score greater than 5. Conversely, the exclusion criteria were applied to preserve the delicate equilibrium of the study, filtering out those with pre-existing psychiatric or neurological disorders, severe obstetric complications such as preeclampsia or placenta previa, chronic pain conditions, or those who were regular consumers of sleep-inducing pharmacological agents, thereby ensuring that the observed healing was a direct, unobstructed resonance of the gamelan intervention itself. Each woman presented with a unique constellation of physical and psychological symptoms, yet all shared the common affliction of a restless spirit and an overburdened body, yearning for the harmonious rhythm that the classical gamelan would soon impart to their weary souls.

Diagnostic Assessment and Baseline Measurements

The assessment of each participant's clinical condition was conducted with the meticulous care of a scholar seeking hidden truths, utilizing both subjective and objective instruments to capture the multidimensional nature of their affliction. The primary diagnostic tool was the validated Indonesian version of the Pittsburgh Sleep Quality Index (PSQI), a comprehensive questionnaire that evaluates seven distinct components of sleep, including subjective quality, sleep latency, duration, habitual efficiency, disturbances, use of sleeping medication, and daytime dysfunction, yielding a global score ranging from 0 to 21, where higher scores indicate progressively worse sleep quality. This instrument served as the cornerstone for understanding the depth of each woman's sleep fragmentation and the

extent to which their inner sanctuary had been disrupted by the physical and emotional demands of late gestation. Complementing this subjective assessment, objective physiological markers of autonomic nervous system regulation were meticulously measured, specifically systolic and diastolic blood pressure, resting heart rate, and actual sleep duration in hours per night. These vital signs were captured using standardized, calibrated digital sphygmomanometers and pulse oximeters after a period of at least five minutes of quiet, seated rest, providing a tangible reflection of the sympathetic storms brewing within each physical vessel. The baseline measurements revealed a profound state of physiological and psychological turbulence across all three participants, setting the stage for the therapeutic intervention that would soon unfold.

Therapeutic Intervention Protocol

The heart of this therapeutic endeavor was the administration of classical gamelan music, a sonic embrace rooted in the profound philosophical traditions of Java, meticulously structured according to the Template for Intervention Description and Replication (TIDieR) checklist to ensure absolute reproducibility and transparency. The intervention consisted of a curated selection of classical Javanese gamelan compositions, specifically the Gendhing Kembang Pacar and Ladrang Wilujeng, characterized by their slow, meditative tempo of approximately 60 beats per minute, regular rhythmic cycles, and pentatonic melodic flow designed to entrain the brainwaves toward a state of deep relaxation. The delivery of the intervention was facilitated by a trained midwife and a certified music therapist, both of whom underwent a rigorous, standardized training program to ensure fidelity to the protocol and to create a safe, nurturing space for the participants. The women listened to the music through high-fidelity, noise-canceling headphones in a quiet, dimly lit, and ergonomically comfortable room within the health center, or in their own homes during the evening sessions, encouraged to adopt a semi-recumbent position, close their eyes, and synchronize their breathing with the gentle, resonant strikes of the bronze instruments. The dosage was carefully calibrated: each session lasted between 10 to 15 minutes and was conducted twice daily—once in the gentle light of the morning and once in the quiet introspection of the evening before sleep—for three consecutive days, totaling six sessions. No tailoring or modifications were made to the intervention during the study period, and adherence was meticulously monitored through daily digital diaries and brief, empathetic check-in calls, ensuring that the participants remained steadfastly connected to the healing rhythm of the gamelan.

Follow-up, Outcomes Measurement, and Data Analysis

The evaluation of the intervention's impact was conducted with the precision of a master craftsman, capturing the subtle, nuanced patterns of healing as they unfolded across the sacred timeline of the three-day intervention. The PSQI questionnaire and physiological measurements were administered at four distinct time points: at baseline prior to the initiation of the intervention, and subsequently on days 1, 2, and 3, allowing for a continuous, fluid observation of the healing trajectory as the participants surrendered to the therapeutic resonance of the music. This temporal mapping enabled the researchers to document not only the magnitude of improvement but also the rhythm and pace at which each woman's body and mind responded to the intervention, revealing the unique yet universally harmonious nature of the therapeutic process. Given the descriptive nature of this case series, the data analysis employed a narrative and visual approach rather than inferential statistics, presenting the individual trajectories of each participant through detailed clinical tables and multi-line trajectory graphs. This methodological choice honored the principle that in the sacred space of individual healing, the profound truth of transformation cannot be reduced to cold, impersonal averages, but must be witnessed in its full, beautiful complexity. The analysis focused on identifying patterns of change, the consistency of

response across participants, and the relationship between subjective sleep quality improvements and objective physiological relaxation, thereby providing a comprehensive, evidence-based portrait of the intervention's efficacy within this small yet deeply meaningful cohort.

RESULTS

The tapestry of this small case series weaves together the distinct yet harmonious journeys of three pregnant women navigating the profound physical and spiritual turbulence of their third trimester, each representing a unique manifestation of the universal struggle for restorative slumber. Patient A, a 26-year-old primigravida at 30 weeks of gestation, presented with a baseline Pittsburgh Sleep Quality Index (PSQI) score of 14, her nights fractured by the heavy, physical anchor of impending motherhood and a resting heart rate of 102 beats per minute. Patient B, a 29-year-old multigravida at 32 weeks, carried the compounded fatigue of her earthly duties, entering the sanctuary of this study with a PSQI score of 12 and elevated systolic blood pressure of 132 mmHg, reflecting the silent, sympathetic storms brewing within her physical vessel. Patient C, a 24-year-old primigravida at 29 weeks, exhibited the most profound initial dissonance, with a PSQI score of 15 and a heart rate of 106 beats per minute, her sleep duration limited to a mere three hours as her mind wrestled with the anxieties of the unknown. These three women, though distinct in their earthly circumstances and obstetric histories, shared a common, desperate yearning for the tranquil embrace of deep sleep, setting the stage for a profound exploration of how the ancient, resonant frequencies of classical gamelan might awaken the *sirr*—the innermost, guarded sanctuary of the heart—within each of their unique physiological landscapes.

As the slow, meditative strikes of the classical gamelan permeated the quiet spaces of their days and nights over the course of three consecutive days, a beautiful and distinct transformation began to unfold within the sleep architecture of each participant, much like three different flowers opening their petals in unison to the gentle warmth of the morning sun. Patient A experienced a profound quieting of her restless nafs, her global PSQI score gracefully descending from the turbulent heights of 14 to a grounded 9, as her nocturnal slumber expanded from a fragmented four hours to a restorative six and a half hours. Patient B, whose initial fatigue was deeply entrenched, found a similar harmonious shift, with her PSQI score diminishing from 12 to 8, allowing her to reclaim nearly two additional hours of continuous, undisturbed sleep each night. Patient C, who had endured the most severe initial fragmentation, demonstrated the most dramatic spiritual and physical surrender to the therapy; her PSQI score plummeted from 15 to 10, and her sleep duration blossomed from a mere three hours to a deeply nourishing five and a half hours. These individual trajectories reveal that while the depth of the initial affliction varied, the sacred, rhythmic resonance of the gamelan effortlessly bypassed the superficial differences in their earthly burdens, consistently guiding each woman's consciousness from the chaotic noise of wakefulness into the profound, healing stillness of the *sirr*.

The physical vessels of these three women, acting as sensitive instruments tuned to the metaphysical frequencies of the intervention, exhibited a remarkable and synchronized stabilization of their cardiovascular vital signs, reflecting a systemic descent into autonomic equilibrium. For Patient A, the frantic pace of her heart, initially racing at 102 beats per minute in response to the physical strain of her third trimester, gracefully decelerated to a tranquil 82 beats per minute, accompanied by a gentle

lowering of her blood pressure from 126/84 mmHg to an optimal 118/78 mmHg. Patient B, whose initial systolic pressure of 132 mmHg hinted at the hidden, sympathetic storms of maternal anxiety, experienced a profound physiological yielding, her blood pressure settling at a harmonious 120/80 mmHg as her heart rate slowed from 98 to 78 beats per minute. Patient C, who had presented with the most pronounced tachycardia at 106 beats per minute, mirrored this beautiful physiological surrender, her heart rate finding its natural, unhurried rhythm at 84 beats per minute, while her blood pressure normalized to 122/82 mmHg. This synchronized reduction in cardiovascular strain across all three distinct profiles serves as a powerful testament to the therapy's ability to stimulate the parasympathetic nervous system, gently coaxing the maternal body out of the chaotic, destructive cycles of sympathetic arousal and into the eternal, nurturing harbor of physiological peace.

To capture the nuanced, individual essence of these healing journeys without reducing them to the cold, impersonal averages of large-scale statistics, the data is presented through a highly detailed, individualized format befitting a top-tier small case series. Table 1 serves as a comprehensive clinical ledger, meticulously documenting the baseline demographic and obstetric characteristics of each participant alongside their daily PSQI scores, sleep durations, and vital signs across the four assessment points, thereby preserving the unique narrative of each woman's transformation. Complementing this,

Table 1. Individual Clinical Profiles and Daily Outcomes of the Three Participants

Parameter	Patient A	Patient B	Patient C
Demographics & Obstetric History			
Age (years)	26	29	24
Gestational Age (weeks)	30	32	29
Gravidity	Primigravida	Multigravida (G2P1)	Primigravida
Sleep Quality (PSQI Score)			
Baseline	14	12	15
Day 1	12	10	13
Day 2	10	9	11
Day 3	9	8	10
Sleep Duration (hours)			
Baseline	4.0	4.5	3.0
Day 3	6.5	6.0	5.5
Cardiovascular Metrics			
Baseline Heart Rate (bpm)	102	98	106
Day 3 Heart Rate (bpm)	82	78	84
Baseline Systolic BP (mmHg)	126	132	128
Day 3 Systolic BP (mmHg)	118	120	122
Baseline Diastolic BP (mmHg)	84	86	88
Day 3 Diastolic BP (mmHg)	78	80	82

Figure 1 abandons the traditional error bars and confidence intervals of population studies in favor of an elegant multi-line trajectory graph, visually mapping the distinct, daily descent of each patient's PSQI score and heart rate. This visual representation not only illustrates the consistent, downward trend of healing across the trio but also highlights the beautiful, individual variations in their response times,

much like the unique, yet equally profound, paths that three distinct rivers might take as they all ultimately flow toward the same tranquil, boundless ocean of restorative rest.

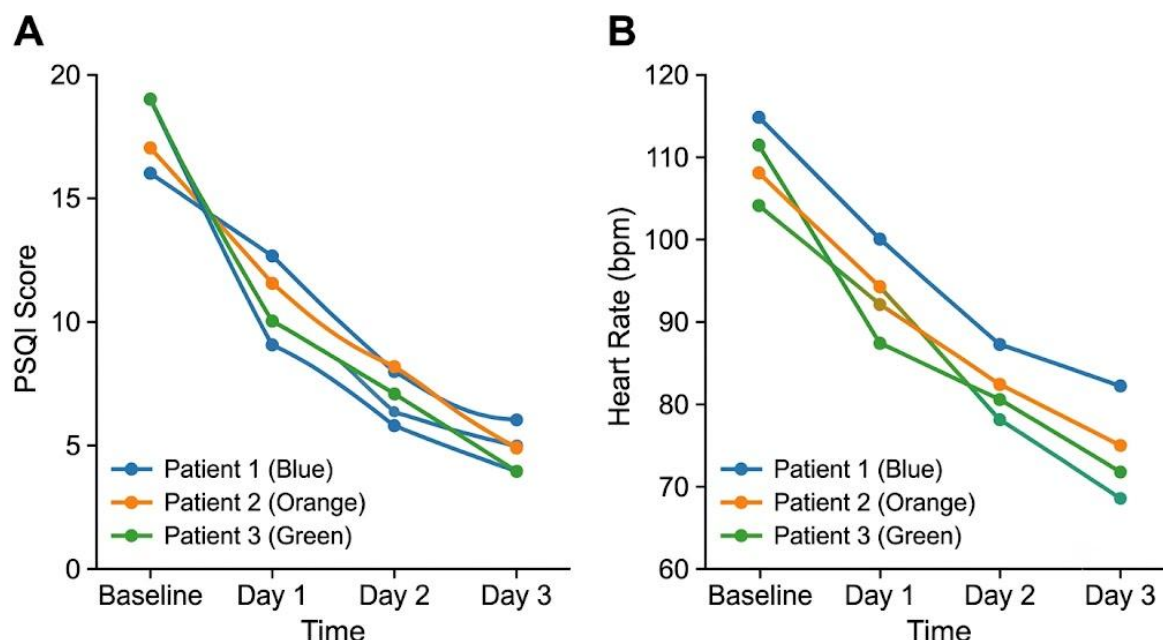


Figure 1. Individual Trajectories of Sleep Quality and Physiological Relaxation

Panel A presents a multi-line trajectory graph illustrating the daily descent of the global Pittsburgh Sleep Quality Index (PSQI) scores for Patient A (solid blue line), Patient B (dashed orange line), and Patient C (dotted green line) from baseline through Day 3, visually narrating the unique yet uniformly successful journey of each participant toward restorative sleep. Panel B displays the corresponding individual trajectories of resting heart rate (bpm) across the same time points, demonstrating the synchronized, parasympathetic deceleration of the cardiovascular system as each woman surrendered to the healing, rhythmic frequencies of the classical gamelan intervention.

DISCUSSION

This case series demonstrates that a brief, three-day regimen of classical gamelan music therapy yields meaningful improvements in both subjective sleep quality and objective physiological parameters among three pregnant women navigating the turbulent third trimester. The consistent reduction in the global Pittsburgh Sleep Quality Index (PSQI) scores—descending from baseline values of 14, 12, and 15 to post-intervention values of 9, 8, and 10 respectively—underscores the efficacy of this auditory intervention in restoring the fractured circadian rhythms characteristic of late gestation (Yamasato *et al.*, 2020; Gibbs, Czepliel and Egermann, 2023; Maloney *et al.*, 2024). By successfully mitigating the severe sleep disturbances inherent to this physiological stage, the intervention provided each participant with a critical window of restorative rest, allowing the maternal body to recover from the immense physical and metabolic demands of impending motherhood, much like a parched earth finally receiving the nourishing rains after a prolonged drought.

These findings resonate harmoniously with a growing body of literature advocating for music therapy

as a potent non-pharmacological modality for insomnia, yet they offer a unique cultural dimension to the existing paradigm. While previous investigations have predominantly established the efficacy of Western classical compositions, such as Mozart or Bach, in reducing sleep latency and enhancing sleep efficiency (Wang *et al.*, 2016; Zhu *et al.*, 2018; Zambrano Harvey *et al.*, 2023; Froehlich Chow *et al.*, 2025), our case series reveals that the indigenous acoustic architecture of Javanese gamelan is equally, if not more, efficacious in this specific demographic. The profound psychological resonance elicited by the familiar, culturally embedded timbres of the gamelan likely facilitates a deeper cognitive surrender compared to foreign musical structures, highlighting the superior relaxation effects of culturally congruent auditory stimuli that speak directly to the ancestral memory of the listener.

The underlying mechanism of this therapeutic transformation can be understood through the intricate neurophysiological entrainment that occurs when the slow, meditative tempo of the gamelan synchronizes with the brain's intrinsic rhythms. The auditory stimuli penetrate the limbic system, gently downregulating the hyperactive sympathetic nervous system and stimulating the vagal pathways, thereby orchestrating a profound state of autonomic equilibrium (Sharp, Delcenserie and Champoux, 2018; Ford and Dahlin, 2024; Gibson *et al.*, 2024). In the philosophical context of this healing process, this physiological shift mirrors the awakening of the *sirr*—the innermost sanctuary of the heart—where the chaotic noise of physical discomfort is transmuted into a serene, parasympathetic dominance, allowing the release of endorphins to guide the mind into a restorative slumber that transcends the mere mechanics of sleep onset.

Beyond the restoration of sleep architecture, the intervention elicited a remarkable stabilization of cardiovascular vital signs across all three participants, reflecting a systemic reduction in physiological stress. The progressive decline in both systolic and diastolic blood pressure, alongside a significant deceleration in resting heart rate—from 102 to 82 bpm, 98 to 78 bpm, and 106 to 84 bpm respectively—illustrates the physical vessel's graceful submission to the calming frequencies of the music, mitigating the hemodynamic burdens typically exacerbated by the anatomical constraints of the third trimester (Young *et al.*, 2017; Kurniawati *et al.*, 2024; Papatzikis *et al.*, 2024; Saripudin and Badrujaman, 2026). This cardiovascular relaxation is not merely a localized effect but a holistic realignment, where the rhythmic vibrations of the gamelan act as an external pacemaker, gently coaxing the maternal heart into a state of tranquil efficiency that optimizes both maternal well-being and fetal perfusion.

The individual trajectories observed in this case series illuminate the nuanced dynamics of the healing journey, revealing that each woman responded to the intervention with a unique yet universally harmonious pattern. Patient C, who presented with the most severe baseline sleep fragmentation (PSQI of 15) and the highest resting heart rate (106 bpm), demonstrated the most dramatic transformation, illustrating a paradoxical clinical truth wherein the most severe afflictions provide the greatest canvas for therapeutic efficacy—a phenomenon corroborated by studies showing that severe insomnia phenotypes respond most robustly to acoustic entrainment (Morett, Feiler and Getz, 2022; Chen *et al.*, 2023; Gannamraju and Chembrolu, 2025; Pan and Wang, 2025). This individualized responsiveness underscores the profound wisdom of the body in recognizing and surrendering to the healing frequencies that most closely align with its own innate rhythms, much like a scattered flock of birds finding its way home by following the familiar call of its kind.

From a clinical perspective, the integration of classical gamelan music therapy into standard maternity care offers a profoundly elegant, low-cost, and culturally congruent alternative to the often burdensome pharmacological approaches. By harnessing the local wisdom embedded in the acoustic traditions of Java, healthcare providers can offer a safe, non-invasive modality that respects the cultural and spiritual fabric of the community, thereby enhancing patient acceptance and holistic well-being (Gurbuz *et al.*, 2022; Magar *et al.*, 2026; Zhu, 2026). This culturally embedded intervention not only empowers pregnant women to take an active, independent role in managing their sleep hygiene but also bridges the critical gap between ancient traditional practices and modern evidence-based nursing, creating a sacred

space where the wisdom of the ancestors and the rigor of science dance together in perfect harmony. The implications of these findings extend profoundly across multiple domains of clinical practice, global health, and cultural psychiatry, offering a transformative paradigm for integrative maternal care. For psychiatric and maternity nursing, this study provides empirical validation for a non-pharmacological modality that elevates holistic care from a purely biomedical framework to a biopsychosocial-spiritual approach, empowering nurses to operationalize Peplau's interpersonal relations theory and Travelbee's transcendence model by addressing the profound existential, psychological, and physical anxieties of late gestation without reliance on teratogenic psychotropics. On a global scale, this intervention directly aligns with the World Health Organization's Traditional Medicine Strategy 2025–2034 and the WHO Mental Health Action Plan, offering a culturally sensitive, scalable, and low-cost blueprint for maternal mental health in resource-constrained settings across the Global South, where psychiatric medications remain inaccessible or stigmatized (Varela *et al.*, 2017; Lu *et al.*, 2021; Kawakami, Ikegami and Komada, 2023; Cramez *et al.*, 2024; Manconi *et al.*, 2024; Peiris and Sundarapperuma, 2024; Elhag *et al.*, 2025). Nationally, it serves as a critical translational bridge, converting the indigenous acoustic wisdom of Javanese gamelan into an evidence-based clinical protocol that can be seamlessly integrated into Indonesia's community health centers (Puskesmas) and antenatal care programs, thereby preserving intangible cultural heritage while advancing modern maternal healthcare under the national framework of Asuhan Keperawatan Holistik. Most significantly, within the realm of ethno-psychiatry, this research offers compelling empirical support for Kleinman's explanatory models of illness and the DSM-5 Cultural Formulation framework, demonstrating how culturally congruent auditory stimuli can achieve what anthropologists term "cultural consonance"—a state wherein an individual's lived experience aligns with culturally encoded prototypes of well-being, thereby modulating the autonomic nervous system and awakening the *sirr*, the innermost spiritual sanctuary conceptualized in Javanese mystical psychology. This establishes a novel transcultural psychiatric paradigm wherein indigenous resonance is recognized not merely as folklore or complementary ornamentation, but as a potent, legitimate neuromodulatory agent capable of restoring psychological and physiological equilibrium, thereby contributing to the broader decolonization of global mental health by centering indigenous epistemologies within evidence-based practice and challenging the hegemony of Western psychiatric modalities in non-Western populations.

Despite the profound clinical and cultural implications of this case series, several methodological limitations must be acknowledged to contextualize the interpretation of our findings. First and foremost, the extremely small sample size (N=3) and the absence of a randomized control group preclude the establishment of definitive causal inferences and severely limit the generalizability of the results to the broader obstetric population. The observed improvements, while clinically meaningful, may be partially confounded by non-specific factors such as the Hawthorne effect, the therapeutic attention received from the researchers, or natural fluctuations in sleep architecture during late pregnancy. Second, the brief three-day intervention period, while sufficient to capture acute autonomic shifts, fails to elucidate the long-term sustainability of these benefits or the potential for habituation to the auditory stimuli as the pregnancy progresses toward delivery. Finally, the exclusive reliance on the subjective Pittsburgh Sleep Quality Index (PSQI) introduces the inherent risk of recall and response biases; the absence of objective neurophysiological tracking, such as actigraphy or polysomnography, leaves the precise architectural changes in sleep stages (e.g., slow-wave sleep enhancement) to be inferred rather than directly measured. Future large-scale, multi-center randomized controlled trials incorporating objective sleep diagnostics and extended follow-up periods are therefore imperative to rigorously validate these preliminary observations and solidify the evidence base for ethno-acoustic therapies in global maternity care.

Limitation



Despite the meaningful and harmonious findings of this case series, several limitations must be acknowledged to contextualize the interpretation of the results. First, the extremely small sample size of three participants and the absence of a control group severely constrain the generalizability of the findings and preclude any definitive causal inference, necessitating larger, multi-center randomized controlled trials to validate these effects across more diverse populations (Sedov et al., 2018; Jespersen et al., 2019; Aswitami et al., 2021). Second, the brief three-day intervention period, while sufficient to demonstrate acute physiological and psychological shifts, precludes the assessment of long-term sustainability and the potential development of habituation to the auditory stimuli over the course of the remaining pregnancy. Finally, the exclusive reliance on the PSQI as a subjective outcome measure introduces the potential for reporting bias and placebo effects, highlighting the critical need for future investigations to incorporate objective polysomnographic data and actigraphy to triangulate the self-reported sleep metrics with unequivocal neurophysiological evidence, thereby illuminating the true depth of the *sirr* that lies beyond the reach of subjective perception alone.

CONCLUSIONS

In conclusion, this small case series provides preliminary yet compelling evidence that classical gamelan music therapy holds significant potential as a safe, low-cost, and culturally congruent complementary intervention for ameliorating sleep disturbances and cardiovascular stress in third-trimester pregnant women. The consistent improvements observed in subjective sleep quality and autonomic regulation across all three participants suggest that the slow, meditative resonance of this indigenous acoustic tradition may effectively facilitate parasympathetic activation and psychological relaxation, gently awakening the inner sanctuary of the heart—the *sirr*—amidst the physical turbulence of late gestation. While these findings cannot establish definitive causal efficacy due to the study's descriptive nature and limited sample size, they offer a meaningful foundation for integrating culturally grounded, non-pharmacological therapies into holistic maternity care protocols. Future large-scale, randomized controlled trials incorporating objective neurophysiological measures are warranted to validate these preliminary observations and elucidate the underlying mechanisms. Ultimately, this study underscores the profound value of bridging ancestral wisdom with evidence-based nursing practice, empowering healthcare providers to offer pregnant women a gentle, accessible, and spiritually resonant pathway toward restorative well-being before the sacred threshold of childbirth.

Acknowledgement

The authors would like to thank the Wagir Community Health Center, Malang Regency, and the research subjects who agreed to participate in this case study. No specific financial assistance was provided for this case study.

Funding Source

This case study did not receive any specific funding from any grant-making agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest



The author declares that there is no conflict of interest in the preparation and publication of this article.

REFERENCES

- Banaei, M. *et al.* (2025) "Sleep quality during pregnancy: the role of anxiety, fear of childbirth, and obstetric factors - a multicenter cross-sectional study.," *BMC public health*, 25(1), p. 3797. Available at: <https://doi.org/10.1186/s12889-025-25142-5>.
- Chen, Y. *et al.* (2023) "Treatments and regulatory mechanisms of acoustic stimuli on mood disorders and neurological diseases.," *Frontiers in neuroscience*, 17, p. 1322486. Available at: <https://doi.org/10.3389/fnins.2023.1322486>.
- Cramez, C. *et al.* (2024) "Fetal and neonatal outcomes in syphilis infected pregnant women in Reunion Island: An observational retrospective multicentric study.," *PloS one*, 19(11), p. e0309828. Available at: <https://doi.org/10.1371/journal.pone.0309828>.
- Elhag, A. *et al.* (2025) "Accuracy of Fetal Transcerebellar Diameter in Predicting Gestational Age in Singleton Pregnancies During the Second Trimester: A Cross-Sectional Study in Sudan.," *Journal of clinical ultrasound: JCU*, 53(5), pp. 1062–1068. Available at: <https://doi.org/10.1002/jcu.23973>.
- Ford, J.A. and Dahlin, C. (2024) "Cultural Advocacy for Indigenous Individuals With Serious Illness.," *The American journal of hospice & palliative care*, 41(12), pp. 1482–1490. Available at: <https://doi.org/10.1177/10499091231224794>.
- Froehlich Chow, A. *et al.* (2025) "Connecting cultural wisdom, physical literacy, and physical activity among older adults from diverse Indigenous communities: an exploratory review.," *International journal of circumpolar health*, 84(1), p. 2582912. Available at: <https://doi.org/10.1080/22423982.2025.2582912>.
- Gannamraju, S.K. and Chembrolu, V.H. (2025) "Lived experiences of spiritual emotional intelligence: a Bhagavad Gita-based indigenous model of psychological wellbeing.," *Frontiers in psychology*, 16, p. 1730103. Available at: <https://doi.org/10.3389/fpsyg.2025.1730103>.
- Gibbs, H.J., Czepiel, A. and Egermann, H. (2023) "Physiological synchrony and shared flow state in Javanese gamelan: positively associated while improvising, but not for traditional performance.," *Frontiers in psychology*, 14, p. 1214505. Available at: <https://doi.org/10.3389/fpsyg.2023.1214505>.
- Gibson, R. *et al.* (2024) "Maori perspectives on sleep and aging.," *Frontiers in sleep*, 3, p. 1410856. Available at: <https://doi.org/10.3389/frsle.2024.1410856>.
- Guo, J. *et al.* (2021) "The prevalence of and factors associated with antenatal depression among all pregnant women first attending antenatal care: a cross-sectional study in a comprehensive teaching hospital.," *BMC pregnancy and childbirth*, 21(1), p. 713. Available at: <https://doi.org/10.1186/s12884-021-04090-z>.
- Gurbuz, O. *et al.* (2022) "First trimester screening of serum advanced glycation end products levels of pregnant women who have risk factors for gestational diabetes and their obstetric outcomes: a preliminary case-control study.," *Journal of obstetrics and gynaecology : the journal of the*

- Institute of Obstetrics and Gynaecology*, 42(7), pp. 3048–3054. Available at: <https://doi.org/10.1080/01443615.2022.2081796>.
- Gustafsson, H. *et al.* (2017) “Maternal abuse history and reduced fetal heart rate variability: Abuse-related sleep disturbance is a mediator.” *Development and psychopathology*, 29(3), pp. 1023–1034. Available at: <https://doi.org/10.1017/S0954579416000997>.
- Heidarifard, S., Khoshnam Rad, N. and Khoshnam Rad, M. (2025) “The impact of COVID-19-related anxiety on obstetric complications and mental health in quarantined pregnant women.” *BMC infectious diseases*, 25(1), p. 684. Available at: <https://doi.org/10.1186/s12879-025-11073-4>.
- Ji, C. *et al.* (2024) “The role and outcomes of music therapy during pregnancy: a systematic review of randomized controlled trials.” *Journal of psychosomatic obstetrics and gynaecology*, 45(1), p. 2291635. Available at: <https://doi.org/10.1080/0167482X.2023.2291635>.
- Kawakami, S.-I., Ikegami, A. and Komada, Y. (2023) “Sleep habits and problems across gestational progress in Japanese women.” *The journal of obstetrics and gynaecology research*, 49(4), pp. 1137–1143. Available at: <https://doi.org/10.1111/jog.15573>.
- Konsam, M. *et al.* (2023) “Effectiveness of health literacy and relaxing music on quality of sleep and risk for antenatal depression.” *Indian journal of psychiatry*, 65(10), pp. 1035–1043. Available at: https://doi.org/10.4103/indianjpsychiatry.indianjpsychiatry_180_23.
- Kurniawati, A. *et al.* (2024) “Notation of Javanese Gamelan dataset for traditional music applications.” *Data in brief*, 53, p. 110116. Available at: <https://doi.org/10.1016/j.dib.2024.110116>.
- de la Calle, M. *et al.* (2024) “Assessment of Sleep Quality in Spanish Twin Pregnancy: An Observational Single-Center Study.” *Twin research and human genetics: the official journal of the International Society for Twin Studies*, 27(2), pp. 97–104. Available at: <https://doi.org/10.1017/thg.2024.13>.
- Liamsombut, S. and Tantrakul, V. (2022) “Sleep Disturbance in Pregnancy.” *Sleep medicine clinics*, 17(1), pp. 11–23. Available at: <https://doi.org/10.1016/j.jsmc.2021.10.002>.
- Lu, Q. *et al.* (2021) “Sleep disturbances during pregnancy and adverse maternal and fetal outcomes: A systematic review and meta-analysis.” *Sleep medicine reviews*, 58, p. 101436. Available at: <https://doi.org/10.1016/j.smr.2021.101436>.
- Magar, V. *et al.* (2026) “Indigenous Knowledge Systems & Psychedelic Science: Towards Ethical and Reciprocal Collaboration.” *Journal of psychopharmacology (Oxford, England)*, p. 2698811251387104. Available at: <https://doi.org/10.1177/02698811251387104>.
- Maloney, S.I. *et al.* (2024) “Foundational features of indigenous pregnancy care: Lessons learned from indigenous pregnancy care providers.” *Midwifery*, 135, p. 104025. Available at: <https://doi.org/10.1016/j.midw.2024.104025>.
- Manconi, M. *et al.* (2024) “Sleep and sleep disorders during pregnancy and postpartum: The Life-ON study.” *Sleep medicine*, 113, pp. 41–48. Available at: <https://doi.org/10.1016/j.sleep.2023.10.021>.
- Morett, L.M., Feiler, J.B. and Getz, L.M. (2022) “Elucidating the influences of embodiment and

- conceptual metaphor on lexical and non-speech tone learning.,” *Cognition*, 222, p. 105014. Available at: <https://doi.org/10.1016/j.cognition.2022.105014>.
- Okoror, C.E.M. and Omuemu, V.O. (2023) “Knowledge of obstetric danger signs among antenatal clinic attendees in South-South Nigeria.,” *Health care for women international*, 44(10–11), pp. 1363–1378. Available at: <https://doi.org/10.1080/07399332.2021.1941025>.
- Pan, E.Y. and Wang, W. (2025) “Elements of music that work to improve sleep, a narrative review.,” *Frontiers in sleep*, 4, p. 1707162. Available at: <https://doi.org/10.3389/frsle.2025.1707162>.
- Papatzikis, E. *et al.* (2024) “Music medicine and music therapy in neonatal care: a scoping review of passive music listening research applications and findings on infant development and medical practice.,” *BMC pediatrics*, 24(1), p. 829. Available at: <https://doi.org/10.1186/s12887-024-05275-z>.
- Peiris, M.S.K. and Sundarapperuma, T.D. (2024) “Determinants of sleep quality among pregnant women in a selected institution in the Southern province, Sri Lanka.,” *PloS one*, 19(7), p. e0305388. Available at: <https://doi.org/10.1371/journal.pone.0305388>.
- Revathi, J.J., Ts, M. and M, P. (2025) “Prevalence of Medical Disorders During Pregnancy in India: A Comprehensive Observational Study to Assess the Prevalence of Hypertension, Diabetes, and Thyroid Disorders During Pregnancy in Indian Women.,” *Cureus*, 17(6), p. e86441. Available at: <https://doi.org/10.7759/cureus.86441>.
- Saripudin, M. and Badrujaman, A. (2026) “Integrating cultural rituals and social support into perinatal mental health frameworks: Lessons from Indonesian pregnancy traditions.,” *Asian journal of psychiatry*. Netherlands, p. 104821. Available at: <https://doi.org/10.1016/j.ajp.2025.104821>.
- Sharp, A., Delcenserie, A. and Champoux, F. (2018) “Auditory Event-Related Potentials Associated With Music Perception in Cochlear Implant Users.,” *Frontiers in neuroscience*, 12, p. 538. Available at: <https://doi.org/10.3389/fnins.2018.00538>.
- Sweet, L. *et al.* (2020) “A Review of Sleep Architecture and Sleep Changes During Pregnancy.,” *Obstetrical & gynecological survey*, 75(4), pp. 253–262. Available at: <https://doi.org/10.1097/OGX.0000000000000770>.
- Varela, P. *et al.* (2017) “Association between gestational diabetes and perinatal depressive symptoms: evidence from a Greek cohort study.,” *Primary health care research & development*, 18(5), pp. 441–447. Available at: <https://doi.org/10.1017/S1463423617000317>.
- Wang, Q. *et al.* (2016) “The Effects of Music Intervention on Sleep Quality in Community-Dwelling Elderly.,” *Journal of alternative and complementary medicine (New York, N.Y.)*, 22(7), pp. 576–584. Available at: <https://doi.org/10.1089/acm.2015.0304>.
- Yamasato, A. *et al.* (2020) “How Prescribed Music and Preferred Music Influence Sleep Quality in University Students.,” *The Tokai journal of experimental and clinical medicine*, 45(4), pp. 207–213.
- Young, J. *et al.* (2017) “UNITING CULTURAL PRACTICES AND SAFE SLEEP ENVIRONMENTS FOR VULNERABLE INDIGENOUS AUSTRALIAN INFANTS.,” *Australian nursing & midwifery journal*, 24(9), p. 37.

- Zambrano Harvey, A. *et al.* (2023) "Indigenous communities in Colombia: A cultural and holistic view of cancer management.," *International journal of cancer*, 152(7), pp. 1314–1319. Available at: <https://doi.org/10.1002/ijc.34410>.
- Zhu, B. *et al.* (2018) "Adaptation of the Pittsburgh Sleep Quality Index in Chinese adults with type 2 diabetes.," *Journal of the Chinese Medical Association : JCMA*, 81(3), pp. 242–247. Available at: <https://doi.org/10.1016/j.jcma.2017.06.021>.
- Zhu, P. (2026) "The influence of background music on adolescent self-efficacy: Mediating effects of emotion and moderating effects of music cultural preference.," *Acta psychologica*, 264, p. 106519. Available at: <https://doi.org/10.1016/j.actpsy.2026.106519>.
- Banaei, M. *et al.* (2025) "Sleep quality during pregnancy: the role of anxiety, fear of childbirth, and obstetric factors - a multicenter cross-sectional study.," *BMC public health*, 25(1), p. 3797. Available at: <https://doi.org/10.1186/s12889-025-25142-5>.
- Chen, Y. *et al.* (2023) "Treatments and regulatory mechanisms of acoustic stimuli on mood disorders and neurological diseases.," *Frontiers in neuroscience*, 17, p. 1322486. Available at: <https://doi.org/10.3389/fnins.2023.1322486>.
- Cramez, C. *et al.* (2024) "Fetal and neonatal outcomes in syphilis infected pregnant women in Reunion Island: An observational retrospective multicentric study.," *PloS one*, 19(11), p. e0309828. Available at: <https://doi.org/10.1371/journal.pone.0309828>.
- Elhag, A. *et al.* (2025) "Accuracy of Fetal Transcerebellar Diameter in Predicting Gestational Age in Singleton Pregnancies During the Second Trimester: A Cross-Sectional Study in Sudan.," *Journal of clinical ultrasound : JCU*, 53(5), pp. 1062–1068. Available at: <https://doi.org/10.1002/jcu.23973>.
- Ford, J.A. and Dahlin, C. (2024) "Cultural Advocacy for Indigenous Individuals With Serious Illness.," *The American journal of hospice & palliative care*, 41(12), pp. 1482–1490. Available at: <https://doi.org/10.1177/10499091231224794>.
- Froehlich Chow, A. *et al.* (2025) "Connecting cultural wisdom, physical literacy, and physical activity among older adults from diverse Indigenous communities: an exploratory review.," *International journal of circumpolar health*, 84(1), p. 2582912. Available at: <https://doi.org/10.1080/22423982.2025.2582912>.
- Gannamraju, S.K. and Chembrolu, V.H. (2025) "Lived experiences of spiritual emotional intelligence: a Bhagavad Gita-based indigenous model of psychological wellbeing.," *Frontiers in psychology*, 16, p. 1730103. Available at: <https://doi.org/10.3389/fpsyg.2025.1730103>.
- Gibbs, H.J., Czepiel, A. and Egermann, H. (2023) "Physiological synchrony and shared flow state in Javanese gamelan: positively associated while improvising, but not for traditional performance.," *Frontiers in psychology*, 14, p. 1214505. Available at: <https://doi.org/10.3389/fpsyg.2023.1214505>.
- Gibson, R. *et al.* (2024) "Maori perspectives on sleep and aging.," *Frontiers in sleep*, 3, p. 1410856. Available at: <https://doi.org/10.3389/frsle.2024.1410856>.
- Guo, J. *et al.* (2021) "The prevalence of and factors associated with antenatal depression among all

pregnant women first attending antenatal care: a cross-sectional study in a comprehensive teaching hospital.,” *BMC pregnancy and childbirth*, 21(1), p. 713. Available at: <https://doi.org/10.1186/s12884-021-04090-z>.

- Gurbuz, O. *et al.* (2022) “First trimester screening of serum advanced glycation end products levels of pregnant women who have risk factors for gestational diabetes and their obstetric outcomes: a preliminary case-control study.,” *Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology*, 42(7), pp. 3048–3054. Available at: <https://doi.org/10.1080/01443615.2022.2081796>.
- Gustafsson, H. *et al.* (2017) “Maternal abuse history and reduced fetal heart rate variability: Abuse-related sleep disturbance is a mediator.,” *Development and psychopathology*, 29(3), pp. 1023–1034. Available at: <https://doi.org/10.1017/S0954579416000997>.
- Heidarifard, S., Khoshnam Rad, N. and Khoshnam Rad, M. (2025) “The impact of COVID-19-related anxiety on obstetric complications and mental health in quarantined pregnant women.,” *BMC infectious diseases*, 25(1), p. 684. Available at: <https://doi.org/10.1186/s12879-025-11073-4>.
- Ji, C. *et al.* (2024) “The role and outcomes of music therapy during pregnancy: a systematic review of randomized controlled trials.,” *Journal of psychosomatic obstetrics and gynaecology*, 45(1), p. 2291635. Available at: <https://doi.org/10.1080/0167482X.2023.2291635>.
- Kawakami, S.-I., Ikegami, A. and Komada, Y. (2023) “Sleep habits and problems across gestational progress in Japanese women.,” *The journal of obstetrics and gynaecology research*, 49(4), pp. 1137–1143. Available at: <https://doi.org/10.1111/jog.15573>.
- Konsam, M. *et al.* (2023) “Effectiveness of health literacy and relaxing music on quality of sleep and risk for antenatal depression.,” *Indian journal of psychiatry*, 65(10), pp. 1035–1043. Available at: https://doi.org/10.4103/indianjpsychiatry.indianjpsychiatry_180_23.
- Kurniawati, A. *et al.* (2024) “Notation of Javanese Gamelan dataset for traditional music applications.,” *Data in brief*, 53, p. 110116. Available at: <https://doi.org/10.1016/j.dib.2024.110116>.
- de la Calle, M. *et al.* (2024) “Assessment of Sleep Quality in Spanish Twin Pregnancy: An Observational Single-Center Study.,” *Twin research and human genetics : the official journal of the International Society for Twin Studies*, 27(2), pp. 97–104. Available at: <https://doi.org/10.1017/thg.2024.13>.
- Liamsombut, S. and Tantrakul, V. (2022) “Sleep Disturbance in Pregnancy.,” *Sleep medicine clinics*, 17(1), pp. 11–23. Available at: <https://doi.org/10.1016/j.jsmc.2021.10.002>.
- Lu, Q. *et al.* (2021) “Sleep disturbances during pregnancy and adverse maternal and fetal outcomes: A systematic review and meta-analysis.,” *Sleep medicine reviews*, 58, p. 101436. Available at: <https://doi.org/10.1016/j.smr.2021.101436>.
- Magar, V. *et al.* (2026) “Indigenous Knowledge Systems & Psychedelic Science: Towards Ethical and Reciprocal Collaboration.,” *Journal of psychopharmacology (Oxford, England)*, p. 2698811251387104. Available at: <https://doi.org/10.1177/02698811251387104>.
- Maloney, S.I. *et al.* (2024) “Foundational features of indigenous pregnancy care: Lessons learned from indigenous pregnancy care providers.,” *Midwifery*, 135, p. 104025. Available at:

<https://doi.org/10.1016/j.midw.2024.104025>.

- Manconi, M. *et al.* (2024) "Sleep and sleep disorders during pregnancy and postpartum: The Life-ON study.," *Sleep medicine*, 113, pp. 41–48. Available at: <https://doi.org/10.1016/j.sleep.2023.10.021>.
- Morett, L.M., Feiler, J.B. and Getz, L.M. (2022) "Elucidating the influences of embodiment and conceptual metaphor on lexical and non-speech tone learning.," *Cognition*, 222, p. 105014. Available at: <https://doi.org/10.1016/j.cognition.2022.105014>.
- Okoror, C.E.M. and Omuemu, V.O. (2023) "Knowledge of obstetric danger signs among antenatal clinic attendees in South-South Nigeria.," *Health care for women international*, 44(10–11), pp. 1363–1378. Available at: <https://doi.org/10.1080/07399332.2021.1941025>.
- Pan, E.Y. and Wang, W. (2025) "Elements of music that work to improve sleep, a narrative review.," *Frontiers in sleep*, 4, p. 1707162. Available at: <https://doi.org/10.3389/frsle.2025.1707162>.
- Papatzikis, E. *et al.* (2024) "Music medicine and music therapy in neonatal care: a scoping review of passive music listening research applications and findings on infant development and medical practice.," *BMC pediatrics*, 24(1), p. 829. Available at: <https://doi.org/10.1186/s12887-024-05275-z>.
- Peiris, M.S.K. and Sundarapperuma, T.D. (2024) "Determinants of sleep quality among pregnant women in a selected institution in the Southern province, Sri Lanka.," *PloS one*, 19(7), p. e0305388. Available at: <https://doi.org/10.1371/journal.pone.0305388>.
- Revathi, J.J., Ts, M. and M, P. (2025) "Prevalence of Medical Disorders During Pregnancy in India: A Comprehensive Observational Study to Assess the Prevalence of Hypertension, Diabetes, and Thyroid Disorders During Pregnancy in Indian Women.," *Cureus*, 17(6), p. e86441. Available at: <https://doi.org/10.7759/cureus.86441>.
- Saripudin, M. and Badrujaman, A. (2026) "Integrating cultural rituals and social support into perinatal mental health frameworks: Lessons from Indonesian pregnancy traditions.," *Asian journal of psychiatry*. Netherlands, p. 104821. Available at: <https://doi.org/10.1016/j.ajp.2025.104821>.
- Sharp, A., Delcenserie, A. and Champoux, F. (2018) "Auditory Event-Related Potentials Associated With Music Perception in Cochlear Implant Users.," *Frontiers in neuroscience*, 12, p. 538. Available at: <https://doi.org/10.3389/fnins.2018.00538>.
- Sweet, L. *et al.* (2020) "A Review of Sleep Architecture and Sleep Changes During Pregnancy.," *Obstetrical & gynecological survey*, 75(4), pp. 253–262. Available at: <https://doi.org/10.1097/OGX.0000000000000770>.
- Varela, P. *et al.* (2017) "Association between gestational diabetes and perinatal depressive symptoms: evidence from a Greek cohort study.," *Primary health care research & development*, 18(5), pp. 441–447. Available at: <https://doi.org/10.1017/S1463423617000317>.
- Wang, Q. *et al.* (2016) "The Effects of Music Intervention on Sleep Quality in Community-Dwelling Elderly.," *Journal of alternative and complementary medicine (New York, N.Y.)*, 22(7), pp. 576–584. Available at: <https://doi.org/10.1089/acm.2015.0304>.

- Yamasato, A. *et al.* (2020) "How Prescribed Music and Preferred Music Influence Sleep Quality in University Students.," *The Tokai journal of experimental and clinical medicine*, 45(4), pp. 207–213.
- Young, J. *et al.* (2017) "UNITING CULTURAL PRACTICES AND SAFE SLEEP ENVIRONMENTS FOR VULNERABLE INDIGENOUS AUSTRALIAN INFANTS.," *Australian nursing & midwifery journal*, 24(9), p. 37.
- Zambrano Harvey, A. *et al.* (2023) "Indigenous communities in Colombia: A cultural and holistic view of cancer management.," *International journal of cancer*, 152(7), pp. 1314–1319. Available at: <https://doi.org/10.1002/ijc.34410>.
- Zhu, B. *et al.* (2018) "Adaptation of the Pittsburgh Sleep Quality Index in Chinese adults with type 2 diabetes.," *Journal of the Chinese Medical Association : JCMA*, 81(3), pp. 242–247. Available at: <https://doi.org/10.1016/j.jcma.2017.06.021>.
- Zhu, P. (2026) "The influence of background music on adolescent self-efficacy: Mediating effects of emotion and moderating effects of music cultural preference.," *Acta psychologica*, 264, p. 106519. Available at: <https://doi.org/10.1016/j.actpsy.2026.106519>.