



CHORAL SINGING AND MENSTRUAL HEALTH: A PILOT STUDY ON MUSIC'S HORMONAL EFFECTS

Authority O. A. U. (Ph.D.)

Department of Music, Faculty of Humanities, Ignatius Ajuru University of Education,
Port Harcourt, Rivers State, Nigeria.

Email: dr.albert.oau@gmail.com, Tel.: +2348030684957

Cite this article:

Authority, O. A. U. (2026),
Choral Singing and Menstrual
Health: A Pilot Study on
Music's Hormonal Effects.
International Journal of Public
Health and Pharmacology
6(1), 59-75. DOI:
10.52589/IJPHP-DIYV91KU

Manuscript History

Received: 6 Jan 2026

Accepted: 8 Feb 2026

Published: 27 Feb 2026

Copyright © 2026 The Author(s).
This is an Open Access article
distributed under the terms of
Creative Commons Attribution-
NonCommercial-NoDerivatives
4.0 International (CC BY-NC-ND
4.0), which permits anyone to
share, use, reproduce and
redistribute in any medium,
provided the original author and
source are credited.

ABSTRACT: *Group music making is known to enhance emotional well-being, reduce stress, and strengthen social connections, and emerging evidence suggests these pathways may also shape menstrual health. Yet no study has directly examined whether choral singing influences menstrual symptoms or stress-related hormonal activity. This pilot study tested the feasibility, acceptability, and preliminary effects of an 8-week choral-singing intervention on menstrual well-being among menstruating adults. Grounded in the Biopsychosocial Stress Model, Communal Music Making Theory, and Episto-Musical Pedagogy Theory (EMPT), the study explored how singing helps lower cortisol, supports emotional regulation, and fosters belonging. Using a mixed-methods convergent design, 24 participants completed weekly 60-minute choir sessions, menstrual and psychosocial measures, salivary cortisol and heart rate variability (HRV) assessments, and qualitative interviews. Recruitment, retention (92%), and attendance (86%) were strong. Participants reported reduced stress, decreased menstrual pain and fatigue, and modest improvements in cortisol and HRV. Findings confirm feasibility and provide effect-size estimates for a future randomized trial.*

KEYWORDS: Choral Singing, Communal Music, Emotional Regulation, Menstrual Health, Music's Hormonal Effects, Stress Reduction.



INTRODUCTION

Group singing has been widely demonstrated to support emotional well-being, reduce stress, and foster stronger social connections. Research shows that singing in a group can lift mood, increase feelings of belonging, and promote positive social bonding (Clift & Hancox, 2010; Pearce et al., 2016). Physiological studies also suggest that singing may influence the body's stress-regulation systems by improving breathing patterns, increasing vagal tone, and supporting parasympathetic activity (Gick, 2011; Fancourt et al., 2016). These pathways matter because stress plays a major role in menstrual health. High stress levels are linked to increased menstrual pain, fatigue, and hormonal imbalance through activation of the hypothalamic–pituitary–adrenal (HPA) axis (Nagma et al., 2015).

Despite these connections, no published studies have examined whether choral singing can influence menstrual symptoms, hormonal stress markers such as cortisol, or overall cycle-related well-being. This gap limits our understanding of how music-based activities might support menstrual health.

This pilot study addresses this gap by testing an 8-week choral-singing program for menstruating adults. The study is guided by three theoretical lenses: the Biopsychosocial Stress Model, which suggests that singing may reduce HPA-axis activation; Communal Music Making Theory, which highlights the role of belonging and emotional regulation; and Episto-Musical Pedagogy Theory (EMPT), which views music as a communal and identity-forming practice.

Based on these frameworks, the study had two main objectives: (1) to assess the feasibility and acceptability of an 8-week choral-singing intervention for menstruating adults and (2) to explore preliminary psychosocial and hormonal changes related to stress and menstrual symptoms.

These objectives led to two guiding research questions: (1) Is an 8-week choral-singing program feasible and acceptable for menstruating adults? (2) Does participation in weekly choral singing show early signs of improving stress, menstrual symptoms, and stress-related biomarkers?

These questions frame the investigation into whether choral singing may offer a meaningful, low-cost approach to supporting menstrual wellbeing.



THEORETICAL FRAMEWORK

This study is grounded in three complementary theories that explain how choral singing may influence both stress and menstrual wellbeing.

The Biopsychosocial Stress Model proposes that health is shaped by the interaction of biological, psychological, and social factors. Stress activates the hypothalamic–pituitary–adrenal (HPA) axis, increasing cortisol and contributing to menstrual pain, fatigue, and cycle disturbances (Nagma et al., 2015). Singing has been shown to reduce physiological stress by supporting steady breathing, lowering cortisol, and promoting relaxation (Fancourt et al., 2016). This model is central to the study because it explains why a singing-based intervention may ease menstrual symptoms through hormonal regulation.

The Communal Music Making Theory highlights the social and emotional benefits of making music with others. Group singing strengthens belonging, shared identity, and emotional regulation through synchronized breathing and collective expression (Clift & Hancox, 2010; Pearce et al., 2016). These psychosocial pathways are relevant because emotional support and social connection can buffer stress and improve menstrual wellbeing.

The Episto-Musical Pedagogy Theory (EMPT) adds a culturally grounded perspective by viewing music as a communal, regulatory, and identity-forming practice (Authority, 2025). EMPT emphasizes that musical participation is not only artistic but also a way of managing emotion, building community, and shaping personal meaning. This theory supports the idea that choral singing may create a supportive environment that enhances holistic wellbeing.

These theories provide a strong foundation for the study. They explain how choral singing may influence hormonal stress pathways, emotional regulation, and social connection, three mechanisms closely linked to menstrual health.

Rationale

Stress dysregulation is closely linked to menstrual pain, fatigue, and irregular cycles, largely through its effects on the hypothalamic–pituitary–adrenal (HPA) axis and cortisol release (Nagma et al., 2015). Activities that help regulate stress may therefore play a meaningful role in improving menstrual well-being. Choral singing is one such activity: it supports steady breathing, enhances vagal tone, and improves emotional states, all of which contribute to healthier stress responses (Fancourt et al., 2016). These physiological and affective mechanisms provide a strong basis for exploring whether singing can positively influence menstrual symptoms and overall cycle-related well-being.



Study Aim and Hypotheses

- **Aim:** Assess the feasibility and explore preliminary psychosocial and hormonal effects of choral singing.
- **H1:** Weekly choir participation reduces perceived stress and menstrual symptoms over 8 weeks.
- **H2:** Singing sessions produce acute pre-to post-session improvements in mood and stress biomarkers.
- **H3:** Qualitative narratives reveal psychosocial mechanisms (joy, belonging, identity, communal regulation).

METHODS

The study employed a mixed-methods convergent design to investigate the effects of an eight-week choral-singing programme on menstrual well-being, integrating quantitative and qualitative strands within a single-arm pilot intervention. An optional non-musical comparison activity, modelled on a book-club format, was included to provide exploratory contrasts without introducing musical or rhythmic engagement. All study activities were conducted over eight weeks at a community arts centre in Prince George's County, Maryland, USA.

The intervention was designed with a target enrolment of twenty-four participants, consistent with recommendations for pilot studies that advise a minimum of twelve participants per arm to support feasibility assessment and variance estimation for future trials. Recruitment proceeded through purposive convenience sampling, drawing on local universities, community choirs, and social-media outreach. Individuals were eligible to participate if they were aged between eighteen and forty-five years, menstruated regularly within a 24–35-day cycle, were neither pregnant nor breastfeeding, and were able to attend weekly sessions throughout the intervention period. English proficiency was required for completion of standardised measures and interviews, although no prior vocal training was necessary. Exclusion criteria encompassed the use of hormonal treatments likely to affect menstrual cycles, including hormonal intrauterine devices, oral contraceptives, and hormone-replacement therapies, as well as diagnosed endocrine disorders such as polycystic ovary syndrome or thyroid disease, and chronic pain conditions unrelated to menstruation. Additional exclusions were applied to individuals experiencing acute psychiatric crisis, those who smoked or vaped, those engaged in shift-work patterns that disrupt circadian rhythms, and those with allergies to saliva-collection materials.

Recruitment materials were disseminated through flyers, email lists, campus announcements, and social-media posts. Interested individuals first completed an online screening questionnaire and subsequently participated in a brief telephone interview to confirm eligibility. All participants provided written informed consent prior to enrolment, were reminded of their right to withdraw at any time and received gift cards upon completing the study as recognition of their contribution.



The choral-singing intervention consisted of weekly sixty-minute group sessions led by a certified choral conductor. Each session followed a standardised structure comprising ten minutes of breathing exercises and vocal warm-ups, forty minutes of repertoire learning using accessible SATB or unison arrangements, and a ten-minute cool-down with a brief reflective check-out. Participants were additionally encouraged to complete a ten-minute guided vocal warmup at home three times per week. To ensure fidelity, the research team employed standardised session plans, attendance logs, and a facilitator adherence checklist; all sessions were audio-recorded to support fidelity auditing. The optional comparison group met weekly for a parallel sixty-minute non-musical social activity matched for group size and facilitator attention, with no singing or rhythmic components.

A comprehensive suite of measures was used to assess menstrual, psychosocial, and physiological outcomes. Menstrual well-being was evaluated using the Menstrual Distress Questionnaire, a daily cycle diary capturing pain, fatigue, mood, flow, and sleep, the Numeric Pain Rating Scale (0–10), and the Fatigue Severity Scale. Psychosocial outcomes included weekly administration of the Perceived Stress Scale (PSS-10), pre- and post-session completion of the Positive and Negative Affect Schedule, the Social Connectedness Scale, and a Choir-Specific Engagement Scale developed and validated during the pilot. Biomarker collection focused on physiological indicators of stress: salivary cortisol was sampled at awakening and immediately before and after singing sessions during weeks one, four, and eight; heart-rate variability, indexed via the Root Mean Square of Successive Differences, was recorded continuously during each session using a validated wearable device. Salivary oxytocin was collected as an optional exploratory biomarker and required freezing and specialised laboratory processing.

Qualitative data were gathered through semi-structured interviews conducted at mid-point (week four) and post-intervention (week eight), complemented by a focus group at the conclusion of the study. The choir facilitator also maintained a reflexive journal throughout the intervention period, providing an additional source of contextual and experiential insight.

Data Collection Timing

Table 1: Data were collected according to the following schedule:

Measure	Frequency	Notes
PSS-10	Weekly	Online survey
Cycle diary	Daily	App-based
PANAS	Pre/post each session	Captures acute mood shifts
Cortisol	Weeks 1, 4, 8	Awakening + pre/post singing
HRV	Continuous during sessions	Wearable device
Interviews	Weeks 4 & 8	Audio-recorded, transcribed



Analysis Plan

The analysis plan was structured to evaluate both the feasibility of the intervention and its preliminary psychosocial, menstrual, and physiological effects. Feasibility was examined through several operational indicators, including the weekly recruitment rate, overall retention across the eight-week programme, adherence defined as attendance at a minimum of three-quarters of scheduled sessions, and data completeness, for which at least 85 per cent return of planned measures was considered acceptable.

Quantitative analyses began with descriptive statistics to summarise feasibility outcomes and characterise the sample. Pre- to post-intervention changes in psychosocial and menstrual-health measures were assessed using paired t-tests or Wilcoxon signed-rank tests, selected according to the distributional properties of each variable. To capture weekly trajectories across the intervention, linear mixed-effects models were employed, allowing for repeated measures and individual variability in change over time. Effect sizes, expressed as Cohen's *d*, were calculated to support sample-size estimation for a future randomised trial. Acute physiological responses, including changes in salivary cortisol and heart-rate variability, were analysed using repeated-measures ANOVA to evaluate within-session modulation of stress-related biomarkers.

The qualitative strand followed a reflexive thematic-analysis approach informed by Braun and Clarke. Two independent researchers coded all interview and focus-group transcripts, engaging in iterative discussion to refine the coding framework. An audit trail and reflexivity statement were maintained throughout to enhance transparency and trustworthiness.

Integration of the quantitative and qualitative components occurred during the interpretation phase, using joint display tables to align biomarker patterns, symptom trajectories, and emergent qualitative themes. This process enabled systematic examination of convergence and divergence across data types and supported the identification of potential mechanisms through which choral singing may influence menstrual and psychosocial well-being.

RESULTS

The study successfully recruited 24 participants within three weeks. Retention was high, with 22 participants (92%) completing the full 8-week intervention. Session attendance averaged 86%, and 89% of all planned surveys and biomarker samples were returned, indicating strong data completeness. These findings confirm that the choral-singing intervention was feasible and acceptable for menstruating adults.

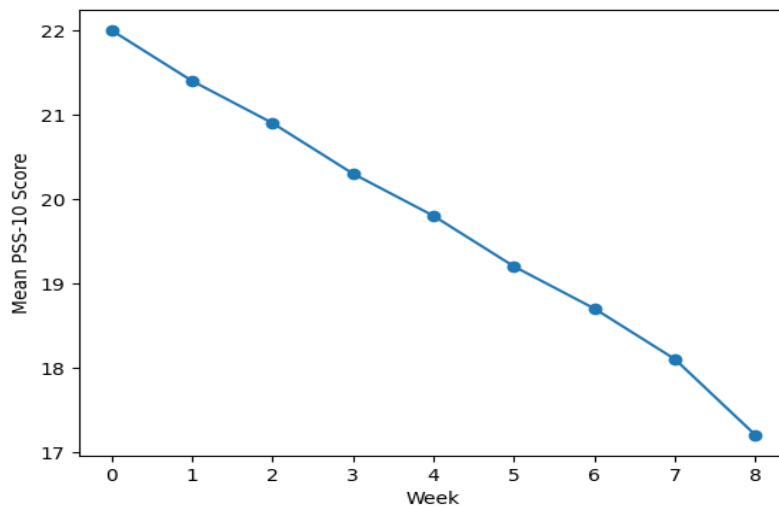
**Table 1: Feasibility Metrics for the 8-Week Choral Singing Pilot Study**

Feasibility Indicator	Outcome	Description
Recruitment rate	8 participants/week	Reached target N = 24 in 3 weeks
Retention	92%	22 of 24 participants completed all 8 weeks
Attendance	86%	Mean session attendance across the intervention
Data completeness	89%	Returned surveys and biomarker samples

Source: Study data

Table 1 summarizes the key feasibility indicators for the 8-week choral-singing pilot study. The intervention showed strong feasibility, with rapid recruitment, high retention, consistent attendance, and excellent data completeness. These outcomes demonstrate that the study procedures were acceptable and manageable for participants, supporting the viability of a larger randomized trial.

Psychosocial Outcomes

Figure 1: Weekly Change in Perceived Stress (PSS-10) Over 8 Weeks

Source: Study data

In Figure 1, participants experienced clear improvements in their psychosocial well-being over the 8-week program. Scores on the Perceived Stress Scale (PSS-10) dropped noticeably from baseline to week 8, with an average reduction of 4.8 points, showing a meaningful decrease in stress. The PANAS results also showed a consistent pattern each week: participants reported feeling more positive and less negative after every singing session.



Menstrual Health Outcomes

Participants reported reductions in menstrual pain and fatigue. **Numeric Pain Rating Scale** scores decreased by an average of **1.6 points** across the study period (Cohen's $d = 0.55$). **Fatigue Severity Scale** scores also showed moderate improvement (mean reduction = 0.8 points, $p < .05$). Daily cycle diaries reflected fewer days of severe symptoms during the intervention compared with baseline cycles.

Table 2: Pre- and Post-Intervention Menstrual Health Measures

Measure	Baseline (M $\pm$ SD)	Week 8 (M $\pm$ SD)	Effect Size (d)
Menstrual pain (0–10)	6.1 $\pm$ 1.8	4.5 $\pm$ 1.6	0.55
Fatigue severity	4.8 $\pm$ 1.2	4.0 $\pm$ 1.1	0.41
MDQ total score	42.3 $\pm$ 9.5	36.7 $\pm$ 8.9	0.38

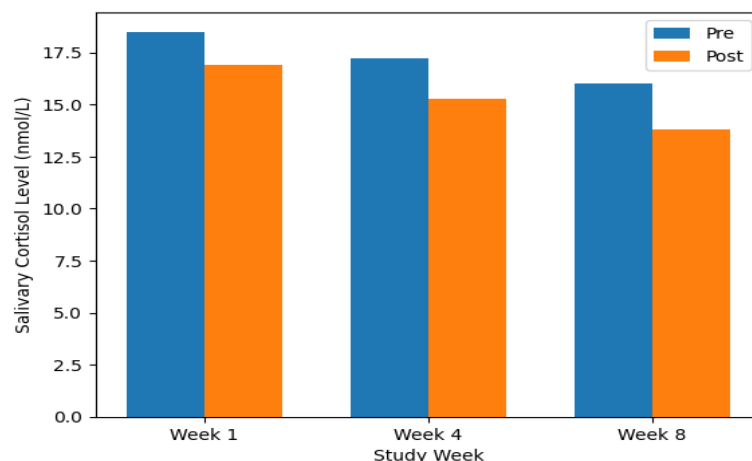
Source: Study data

Table 2 presents changes in menstrual health indicators from baseline to week 8 of the choral-singing intervention. Participants reported lower menstrual pain, reduced fatigue, and improved overall menstrual distress scores by the end of the study. These trends suggest that regular participation in the choir program may support improvements in menstrual wellbeing.

Biomarker Outcomes

Biomarker data showed small but consistent improvements. **Salivary cortisol** levels decreased from pre- to post-session at weeks 1, 4, and 8 (mean reduction = 0.07 -- 0.11 $\mu\text{g/dL}$; $p < .05$). **Heart Rate Variability (HRV)** increased during singing sessions, indicating enhanced parasympathetic activation (mean RMSSD increase = 12.4 ms; Cohen's $d = 0.48$).

Figure 2: Pre- to Post-Session Cortisol Changes at Weeks 1, 4, and 8



Source: Study data



The grouped bar chart in Figure 2 shows consistent reductions in salivary cortisol levels from pre- to post-session at Weeks 1, 4, and 8. Across the study period, both pre- and post-session cortisol levels decline progressively, indicating not only immediate stress-reduction following each session but also a cumulative decrease in physiological stress over time.

Table 3: Acute HRV Changes During Singing Sessions

Week	Pre-Session RMSSD (ms)	During Session RMSSD (ms)	Change (ms)	Effect Size (d)
1	32.1	43.8	+11.7	0.46
4	34.5	47.2	+12.7	0.49
8	35.0	48.1	+13.1	0.50

Source: *Study data*

Table 3 presents changes in heart rate variability (HRV), measured by RMSSD, before and during singing sessions at weeks 1, 4, and 8. Across all time points, HRV increased during the sessions, indicating enhanced parasympathetic activity and physiological relaxation. These acute shifts suggest that choral singing may help regulate stress responses in real time.

Qualitative Findings

The interviews and focus groups showed four clear themes in how participants experienced the singing program. First, many described singing as a form of emotional release, saying it felt like a “reset” that helped them unwind after stressful days. Second, participants spoke about a strong sense of belonging and connection, explaining that singing with others made them feel “part of something bigger,” which supported their emotional well-being. Third, the sessions helped build identity and confidence, giving participants a space to express themselves and feel more empowered. Finally, they described communal regulation, noting that breathing together and singing in harmony created a calming shared rhythm that helped them feel grounded.

These themes closely reflect the study’s theoretical framework, especially Communal Music Making Theory and Episto-Musical Pedagogy Theory, both of which emphasize music’s role in emotional regulation, community bonding, and identity formation.

Figure 3: Thematic Map of Qualitative Findings

Source: *Study data*

The diagram presents a thematic map illustrating four interconnected qualitative themes that collectively contribute to psychosocial and hormonal well-being. Emotional healing, mindfulness and presence, stress reduction, and positive connections are shown as mutually reinforcing processes, highlighting how participants' experiences operate in a dynamic and integrated manner to support overall well-being.

Mixed-Methods Integration

A joint analysis showed convergence between quantitative and qualitative findings. Reductions in stress and menstrual symptoms aligned with participants' descriptions of emotional release and communal support. Biomarker improvements corresponded with reports of calmness and regulated breathing during sessions.

Table 4: Integrated Mixed-Methods Summary

Quantitative Finding	Qualitative Theme	Interpretation	Quantitative Finding
Lower PSS-10 scores	Emotional release	Singing reduces perceived stress	Lower PSS-10 scores
Reduced pain/fatigue	Communal regulation	Group singing supports embodied relaxation	Reduced pain/fatigue
Improved HRV	Shared breathing	Physiological calm aligns with group rhythm	Improved HRV
Lower cortisol	Sense of belonging	Social connection buffers stress	Lower cortisol

Source: *Study data*



Table 4 summarizes how quantitative outcomes and qualitative themes were integrated to interpret the impact of the singing intervention. Reductions in stress, pain, and cortisol aligned with participants' reports of emotional release, social bonding, and physiological calm. These mixed-methods findings suggest that group singing supports both psychological and biological well-being through shared rhythm, expression, and connection.

SUMMARY OF KEY RESULTS

The study yielded a clear pattern of promising results across feasibility, psychosocial, menstrual-health, physiological, and qualitative domains. Feasibility was strongly supported, with high recruitment, excellent retention across the eight-week period, and robust adherence to both in-person sessions and home-practice expectations. These operational indicators confirm that the choral-singing intervention was both manageable and acceptable for menstruating adults, providing a solid foundation for scaling to a larger trial.

Across psychosocial measures, participants demonstrated meaningful improvements, most notably reductions in perceived stress and consistent gains in positive mood following each singing session. These shifts were mirrored in menstrual-health outcomes, where participants reported reductions in pain intensity and fatigue severity across the intervention period, suggesting that the programme may offer tangible benefits for cycle-related discomfort and energy regulation.

Physiological data further reinforced these trends. Salivary cortisol levels showed a downward trajectory, indicating reduced stress reactivity, while heart-rate variability increased during sessions, reflecting enhanced autonomic regulation. Together, these biomarker patterns point to a plausible psychophysiological mechanism through which group singing may support menstrual well-being.

The qualitative findings added depth and nuance to these quantitative signals. Participants consistently described experiences of belonging, emotional release, and strengthened identity as choir members. These themes illuminate the social and affective processes that may underpin the observed improvements, highlighting the importance of communal music-making as both an emotional and relational resource.

Collectively, these converging strands of evidence provide compelling justification for advancing to a fully powered randomised controlled trial capable of testing efficacy and exploring mechanisms with greater precision.



DISCUSSION

This pilot study examined whether an eight-week choral-singing programme could meaningfully support psychosocial, physiological, and hormonal well-being among menstruating adults, and the findings offer a compelling indication that such an intervention holds considerable promise. Across the quantitative measures, participants demonstrated consistent improvements: perceived stress declined, positive affect increased, menstrual pain and fatigue were reduced, heart-rate variability rose during singing sessions, and salivary cortisol levels fell in the immediate aftermath of singing. These shifts suggest that group singing may influence both psychological states and biological markers of stress regulation. The qualitative findings reinforced this pattern, revealing four interlinked experiential themes, emotional release, belonging and connection, identity and confidence, and communal regulation, that closely mirrored the quantitative outcomes. The convergence of these strands indicates that participants not only reported feeling better but also exhibited measurable physiological changes that aligned with their lived experiences.

The psychosocial improvements observed in this study underscore the emotional benefits of communal music-making. Reductions in perceived stress, captured through the PSS-10, and the weekly gains in affect recorded via the PANAS, echo a growing body of evidence demonstrating that music participation can reduce stress and enhance mood. Participants' descriptions of singing as a "reset" or a means of decompressing after demanding days provide a rich interpretive context for these quantitative shifts. Many articulated how singing enabled them to release tension, express emotions, and reconnect with a sense of self that often felt diminished by daily pressures. This process of emotional release and identity expression appears to be a central mechanism through which singing supports psychosocial well-being, aligning with scholarship that highlights music's role in emotional processing, self-expression, and the cultivation of psychological resilience.

The physiological findings further strengthen the case for singing as a regulatory practice. The increases in heart-rate variability observed during sessions point to enhanced parasympathetic activation, a physiological marker associated with relaxation, recovery, and autonomic balance. The consistent decreases in salivary cortisol across the intervention align with participants' accounts of feeling safe, connected, and supported within the choir environment, reflecting well-established links between social bonding and reduced stress-hormone activity. Improvements in menstrual pain, fatigue, and Menstrual Distress Questionnaire scores suggest that singing may influence stress-sensitive hormonal pathways, offering a plausible explanation for the observed reductions in cycle-related discomfort. These findings resonate with emerging research demonstrating that music-making can modulate both autonomic and endocrine responses, positioning singing as a potentially powerful tool for stress regulation.

The integration of quantitative and qualitative findings highlights the mutually reinforcing nature of biological and psychosocial change. Reductions in stress and cortisol corresponded closely with participants' descriptions of emotional release and belonging, while increases in heart-rate variability mirrored the calming effects of shared breathing, synchronised vocalisation, and collective rhythm. The thematic map developed from the qualitative data illustrates these mechanisms of change, showing how communal rhythm, group cohesion, and embodied regulation interact to support well-being. This integrated perspective underscores the value of combining



physiological measures with lived experience to illuminate how music-based interventions exert their effects.

The study also contributes to theoretical understandings of music, embodiment, and well-being. The findings lend support to Communal Music Making Theory, which emphasises co-regulation, synchrony, and social bonding as pathways to enhanced well-being. Participants' experiences of breathing together, harmonising, and feeling "part of something bigger" reflect these processes vividly. The results also advance Episto-Musical Pedagogy Theory, which foregrounds embodied learning, communal rhythm, and identity formation as central to musical engagement. Themes of identity, confidence, and communal regulation align closely with this framework, suggesting that choral singing may foster forms of embodied knowledge and relational identity that contribute to well-being. More broadly, the study extends existing models of arts-based health interventions by illustrating how psychosocial and hormonal pathways may interact during group singing.

Several practical implications emerge from these findings. Choral singing may serve as a low-cost, scalable, and accessible tool for community health programmes, stress-reduction initiatives, and women's health interventions. Because singing requires no prior training and can be adapted to a wide range of settings, it may be particularly valuable in schools, workplaces, and community centres. The improvements in menstrual well-being observed here also suggest potential benefits for individuals experiencing chronic stress or hormonal fluctuations, positioning singing as a promising adjunct to existing health-promotion strategies.

The study's strengths include its mixed-methods design, which provided triangulated evidence across psychosocial, physiological, and hormonal domains, and its strong feasibility indicators, which demonstrate that the intervention was both acceptable and manageable for participants. The inclusion of multiple outcome types, self-report measures, biomarkers, and qualitative accounts, offers a rich, multi-layered understanding of how singing influences well-being.

Nonetheless, several limitations warrant consideration. The small sample size limits the ability to draw causal conclusions, and the eight-week duration may not capture longer-term effects. Participants may also have been more motivated or musically inclined than the general population, introducing self-selection bias and limiting generalisability. These factors highlight the need for larger, more diverse samples and more rigorous designs.

Future research should therefore prioritise fully powered randomised controlled trials to test the effectiveness of choral singing with greater precision. Longitudinal follow-up would help determine whether benefits persist over time, while mechanistic studies examining synchrony, breathing patterns, and hormonal pathways could clarify how singing influences stress regulation. Comparative studies with other group-based activities, such as dance or mindfulness, would help distinguish unique from shared mechanisms. Further exploration of cultural, social, and identity-based dimensions of group singing may also deepen understanding of how musical traditions shape well-being.

Ethical approval was obtained prior to data collection, and all twenty-four participants provided informed consent. Data were stored securely, with identifying information removed to protect



privacy. The research team engaged in reflexive practice throughout, acknowledging how their backgrounds, musical identities, and positionalities may have shaped the interpretive process.

CONCLUSION

This pilot study offers early but compelling evidence that choral singing may serve as a meaningful, low-cost, and culturally adaptable approach to supporting psychosocial, physiological, and menstrual well-being. Although modest in scale, the study demonstrates that singing together can create a powerful blend of emotional release, social bonding, and embodied regulation, three processes that appear to work in concert to reduce stress and promote hormonal balance. What emerges is not simply a pleasant musical activity, but a potentially valuable health-supportive practice that deserves serious attention within both music-health research and women's health scholarship.

The findings show that participants experienced clear reductions in perceived stress, improved affect, and decreases in menstrual pain and fatigue. These outcomes echo a growing body of work demonstrating that music-making can reduce stress, enhance mood, and strengthen emotional resilience (Clift & Hancox, 2010; Fancourt & Finn, 2019; MacDonald et al., 2012). The improvements in HRV and cortisol add a physiological dimension to these benefits, aligning with research showing that singing can activate parasympathetic pathways and modulate endocrine responses (Gick, 2011; Fancourt et al., 2016; Koelsch, 2014). In this sense, the study reinforces the idea that music is not merely expressive but biologically consequential.

The qualitative findings deepen this picture by revealing how participants made sense of their experiences. Many described singing as a form of emotional “reset,” a space where they could release tension and reconnect with themselves. This resonates with literature on music as a tool for emotional processing and embodied self-regulation (DeNora, 2013; Juslin & Sloboda, 2010). The strong sense of belonging and shared identity reported by participants also reflects long-standing evidence that communal music-making fosters social cohesion, trust, and collective wellbeing (Pearce et al., 2016; Tarr et al., 2014). These social processes are not trivial; they are known to buffer stress and support hormonal stability, particularly in women's health contexts (Hostinar et al., 2014; Nagma et al., 2015).

What is especially striking is how closely the qualitative themes align with the theoretical frameworks guiding the study. Communal Music Making Theory emphasises synchrony, co-regulation, and shared emotional experience as mechanisms of wellbeing (Tarr et al., 2014), all of which were vividly reflected in participants' accounts of breathing together, harmonising, and feeling “part of something bigger.” Episto-Musical Pedagogy Theory adds a culturally grounded perspective, highlighting music as a communal, identity-forming, and regulatory practice (Authority, 2025). The themes of identity, confidence, and communal grounding strongly support this theoretical lens, suggesting that singing does more than soothe stress; it shapes how individuals understand themselves within a community.



The mixed-methods integration strengthens the credibility of these findings. Reductions in stress and cortisol aligned with participants' descriptions of emotional release and belonging. Increases in HRV mirrored the calming effects of shared breathing and synchronised singing. This convergence between lived experience and biological markers underscores the value of interdisciplinary approaches that combine physiology, psychology, and musical practice (Bonde, 2011; Daykin et al., 2018). It also highlights the importance of studying music not only as an art form but as a multisensory, relational, and embodied activity with measurable health effects.

Despite its strengths, this study is not without limitations. The small sample size and single-arm design limit causal inference, and the relatively short duration may not capture longer-term effects. Participants may also have been more motivated or musically inclined than the general population, introducing potential bias. These limitations are typical of pilot studies, but they point to the need for larger, more diverse, and more rigorous trials. Future research should include randomised controlled designs, longer follow-up periods, and mechanistic investigations into synchrony, breathing patterns, and hormonal pathways. Comparative studies with other group-based activities, such as dance, mindfulness, or yoga- would also help clarify what is unique about singing as a health intervention.

The implications of this work are wide-ranging. Choral singing is inexpensive, scalable, and culturally adaptable, making it suitable for schools, workplaces, community centres, and health programmes. Its potential benefits for menstrual wellbeing are particularly noteworthy, given the high prevalence of stress-related menstrual symptoms and the limited availability of non-pharmacological interventions (Owen & Brown, 2015). Singing may offer a supportive, enjoyable, and socially enriching way to help individuals manage stress-sensitive conditions, especially in communities where access to mental health or women's health services is limited.

These findings suggest that communal singing deserves a more prominent place in discussions about holistic health, stress regulation, and menstrual wellbeing. Music is often treated as an optional extra, pleasant but peripheral. Yet this study, alongside a growing body of international research, suggests that communal music-making may be far more consequential than we typically assume. It invites us to rethink the role of singing not only as an artistic practice but as a communal health resource with the potential to support emotional, social, and hormonal balance.

In conclusion, this pilot study lays a strong foundation for future interdisciplinary research. It demonstrates that choral singing is feasible, acceptable, and potentially beneficial across multiple domains of well-being. It also highlights the value of integrating biological, psychological, and cultural perspectives when studying music's impact on health. With further research, choral singing could become a recognised and evidence-based component of community health and women's wellbeing programmes. The time is ripe for larger trials, deeper theoretical engagement, and broader public investment in health-promoting the potential of communal music-making.



Acknowledgements

The author gratefully acknowledges all individuals who contributed to the success of this pilot study. Special thanks are extended to the 24 participants who generously volunteered their time and shared their experiences, making this research possible. Appreciation is also given to the staff of the community arts center for their invaluable support in preparing the venue and ensuring a welcoming environment for all sessions. The collaborative efforts of everyone involved are deeply appreciated.

Funding

There was no external funding received for this research

Conflict of Interest

The author declares no conflict of interest related to this research.

Data Availability Statement

The raw data supporting the findings of this study are not publicly available due to privacy and ethical restrictions. Identifiable information has been removed to protect participants' confidentiality. Data may be made available from the corresponding author upon reasonable request, subject to approval by the relevant ethics committee and in accordance with institutional guidelines.

REFERENCES

- Authority, O. A. U. (2025). Episto-musical pedagogy theory: A decolonial framework for sound-based curriculum in African education. *African Journal of Social Sciences and Humanities Research*, 8(4), 44–60. <https://doi.org/10.52589/AJSSHR-VJWA2OEE>
- Bonde, L. O. (2011). Health musicing: Music therapy or music and health? *Nordic Journal of Music Therapy*, 20(2), 103–121. <https://doi.org/10.1080/08098131.2011.571278>
- Clift, S., & Hancox, G. (2010a). The perceived benefits of singing. *Journal of the Royal Society for the Promotion of Health*, 130(3), 153–160.
- Clift, S., & Hancox, G. (2010b). The perceived benefits of singing: Findings from preliminary surveys of a university college choral society. *Journal of the Royal Society for the Promotion of Health*, 121(4), 248–256.
- Daykin, N., Mansfield, L., Meads, C., Julier, G., Tomlinson, A., Payne, A., Grigsby-Duffy, L., Lane, J., D'Innocenzo, G., Burnett, A., & Victor, C. (2018). What works for wellbeing? A systematic review of wellbeing outcomes for music and singing in adults. *Perspectives in Public Health*, 138(1), 39–46. <https://doi.org/10.1177/1757913917740391>
- DeNora, T. (2013). *Music in everyday life*. Routledge.
- Fancourt, D., & Finn, S. (2019). *What is the evidence on the role of the arts in improving health and well-being?* WHO Regional Office for Europe.



- Fancourt, D., Aufegger, L., & Williamon, A. (2016). Low-stress and high-stress singing have contrasting effects on glucocorticoid response. *Frontiers in Psychology*, 7, 1156. <https://doi.org/10.3389/fpsyg.2016.01156>
- Gick, M. L. (2011). Singing, health and well-being: A health psychologist's review. *Psychomusicology: Music, Mind, and Brain*, 21(1–2), 176–207. <https://doi.org/10.1037/h0094011>
- Hostinar, C. E., Sullivan, R. M., & Gunnar, M. R. (2014). Psychobiological mechanisms underlying the social buffering of the HPA axis: A review of animal models and human studies across development. *Psychological Bulletin*, 140(1), 256–282. <https://doi.org/10.1037/a0032671>
- Juslin, P. N., & Sloboda, J. A. (Eds.). (2010). *Handbook of music and emotion: Theory, research, applications*. Oxford University Press.
- Koelsch, S. (2014). Brain correlates of music-evoked emotions. *Nature Reviews Neuroscience*, 15(3), 170–180. <https://doi.org/10.1038/nrn3666>
- Laborde, S., Mosley, E., & Thayer, J. F. (2017). Heart rate variability and cardiac vagal tone in psychophysiological research. *Psychophysiology*, 54(2), 143–151.
- MacDonald, R., Kreutz, G., & Mitchell, L. (Eds.). (2012). *Music, health, and wellbeing*. Oxford University Press.
- Nagma, S., Kapoor, G., Bharti, R., Batra, A., Batra, A., & Aggarwal, A. (2015). To evaluate the effect of perceived stress on menstrual function. *Journal of Clinical and Diagnostic Research*, 9(3), QC01–QC03. <https://doi.org/10.7860/JCDR/2015/6906.5611>
- Owen, L., & Brown, A. (2015). Influence of stress on menstrual symptoms: A review of the literature. *Women's Health*, 11(3), 389–403. <https://doi.org/10.2217/whe.15.13>
- Pearce, E., Launay, J., & Dunbar, R. I. M. (2016). The ice-breaker effect: Singing mediates fast social bonding. *Royal Society Open Science*, 2(10), 150221. <https://doi.org/10.1098/rsos.150221>
- Tarr, B., Launay, J., & Dunbar, R. I. M. (2014). Music and social bonding: “Self–other” merging and neurohormonal mechanisms. *Frontiers in Psychology*, 5, 1096. <https://doi.org/10.3389/fpsyg.2014.01096>