

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

Carlos Borromeu de Assis Belo^{1*}, Indah Sri Wahyuningsih², Dwi Heppy Rochmawati², Erna Melastuti²

¹Master of Nursing, Faculty of Nursing, Universitas Islam Sultan Agung, Semarang, Indonesia

²Faculty of Nursing, Universitas Islam Sultan Agung, Semarang, Indonesia

ABSTRACT

ARTICLE DETAILS

Background: Pulmonary tuberculosis remains a significant global health problem and is often associated with impaired gas exchange leading to decreased oxygen saturation. Non-pharmacological interventions such as pursed-lip breathing and music therapy have been explored to improve respiratory function and enhance patient comfort.

Objective: This review aims to analyze the synergistic effects of pursed-lip breathing and music therapy on oxygen saturation in patients with pulmonary tuberculosis.

Methods: A narrative literature review was conducted on articles published between 2021 and 2026. Literature searches were performed using databases including PubMed, Google Scholar, ScienceDirect, DOAJ, and Garuda with relevant keywords. A total of 15–20 articles were selected based on inclusion criteria and analyzed descriptively.

Results: The findings indicate that pursed-lip breathing improves ventilation efficiency, prolongs exhalation, and enhances oxygen exchange, while music therapy promotes relaxation, reduces anxiety, and stabilizes respiratory patterns. Several studies reported improvements in oxygen saturation and overall respiratory parameters following these interventions.

Discussion: The combination of pursed-lip breathing and music therapy may produce synergistic effects by integrating physiological and psychological mechanisms, leading to improved oxygenation and reduced respiratory distress in pulmonary tuberculosis patients.

Conclusion: Pursed-lip breathing combined with music therapy shows potential as a complementary intervention to improve oxygen saturation in pulmonary tuberculosis, although further high-quality studies are needed to strengthen the evidence.

KEYWORDS: Complementary therapy; music therapy; non-pharmacological intervention; oxygen saturation; pulmonary rehabilitation; pulmonary tuberculosis; pursed-lip breathing; respiratory function

Published On:
27 August 2026

Available on:
<https://ijpbms.com/>

INTRODUCTION

Pulmonary tuberculosis remains a major global health concern, particularly in low- and middle-income countries, where it continues to contribute significantly to morbidity and mortality. Beyond infection, the disease often leads to structural lung damage that interferes with effective gas exchange, resulting in decreased oxygen saturation and persistent respiratory symptoms.

Impaired oxygenation in pulmonary tuberculosis is closely related to chronic inflammation, alveolar destruction, and reduced lung compliance. These changes often manifest as

dyspnea, increased respiratory rate, and inefficient breathing patterns, which may persist even during treatment. Therefore, improving oxygen saturation is not only essential for physiological stability but also plays a crucial role in enhancing functional capacity and overall recovery.

In recent years, non-pharmacological approaches have gained attention as supportive strategies in respiratory care. One commonly applied technique is pursed-lip breathing, which focuses on controlled and prolonged exhalation. This technique helps prevent airway collapse, improves ventilation efficiency, and reduces the work of breathing.

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

Several recent studies have demonstrated that pursed-lip breathing contributes to improved oxygen saturation and respiratory function in patients with chronic respiratory conditions [1–3]. In addition, research involving pulmonary rehabilitation programs has highlighted the role of breathing exercises in stabilizing oxygen levels and enhancing pulmonary performance [4].

Alongside breathing techniques, music therapy has emerged as a complementary intervention with promising physiological and psychological benefits. Music has been shown to influence the autonomic nervous system, promote relaxation, and reduce anxiety, all of which can contribute to more stable and efficient breathing patterns. A study reported that integrating music-based interventions into pulmonary rehabilitation programs improved both respiratory outcomes and patient comfort [5]. Similarly, music therapy can support symptom management and improve overall well-being in patients with chronic respiratory diseases [6].

Furthermore, combining breathing exercises with relaxation-based interventions appears to provide additional benefits. Found that breathing exercises integrated with relaxation techniques led to improvements in physiological parameters, including oxygen saturation, among patients with pulmonary conditions [7]. This suggests that interventions targeting both physical and psychological aspects may produce more comprehensive outcomes.

Despite these findings, most existing studies have examined pursed-lip breathing and music therapy separately. Evidence specifically addressing their combined use in patients with pulmonary tuberculosis remains limited. Considering that these interventions act through different yet complementary mechanisms, physiological optimization of ventilation and psychological regulation of stress, their integration may offer a synergistic effect in improving oxygen saturation. This gap in the literature highlights the need for a more focused and integrative review.

Therefore, this narrative literature review aims to explore and analyze the synergistic effects of pursed-lip breathing and music therapy on oxygen saturation in patients with pulmonary tuberculosis based on recent evidence published between 2021 and 2026.

METHOD

This study employed a narrative literature review approach to explore the synergistic effects of pursed-lip breathing and

music therapy on oxygen saturation in patients with pulmonary tuberculosis. The review focused on recent evidence published between 2021 and 2026 to ensure the relevance of findings with current clinical practice.

LITERATURE SEARCH STRATEGY

A comprehensive literature search was conducted using several electronic databases, including PubMed, Google Scholar, ScienceDirect, DOAJ, and Garuda. The search process was carried out using combinations of keywords such as “*pulmonary tuberculosis*,” “*pursed-lip breathing*,” “*music therapy*,” “*oxygen saturation*,” and “*respiratory function*.” Boolean operators (AND, OR) were applied to refine the search and obtain more specific results. Only articles published in English and Indonesian were considered.

Study Selection Process

The selection of articles was performed in several stages. Initially, titles and abstracts were screened to identify studies relevant to the topic. Articles that did not match the focus of the review, such as those unrelated to respiratory interventions or oxygen saturation, were excluded. In the next stage, full-text articles were assessed based on predefined inclusion criteria, including: (1) studies involving respiratory interventions such as pursed-lip breathing or music therapy, (2) studies reporting outcomes related to oxygen saturation or respiratory parameters, and (3) articles published within the specified time frame (2021–2026).

Exclusion criteria included duplicate publications, incomplete articles, and studies with unclear methodology or outcomes. The final set of selected articles was then reviewed in detail for data extraction and synthesis. The overall selection process followed a structured flow similar to the PRISMA approach, including identification, screening, eligibility, and inclusion stages.

Data Analysis and Synthesis

The selected studies were analyzed using a descriptive and thematic approach. Key findings from each article were identified, compared, and grouped based on similarities in intervention type, outcome measures, and reported effects. The analysis focused on understanding how pursed-lip breathing and music therapy influence oxygen saturation, both individually and in combination.

Table 1: Data Search Based

Database	Keyword	Number of Articles Found
PubMed	Pulmonary tuberculosis, pursed-lip breathing, music therapy, oxygen saturation	9
ScienceDirect	Pursed-lip breathing, music therapy, respiratory function, oxygen saturation	6
Google Scholar	Pulmonary tuberculosis, breathing exercise, music therapy, oxygenation	10

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

DOAJ	Non-pharmacological therapy, pulmonary rehabilitation, and oxygen saturation	4
Garuda	Tuberkulosis paru, pursed lip breathing, terapi musik, saturasi oksigen	3
Total		32

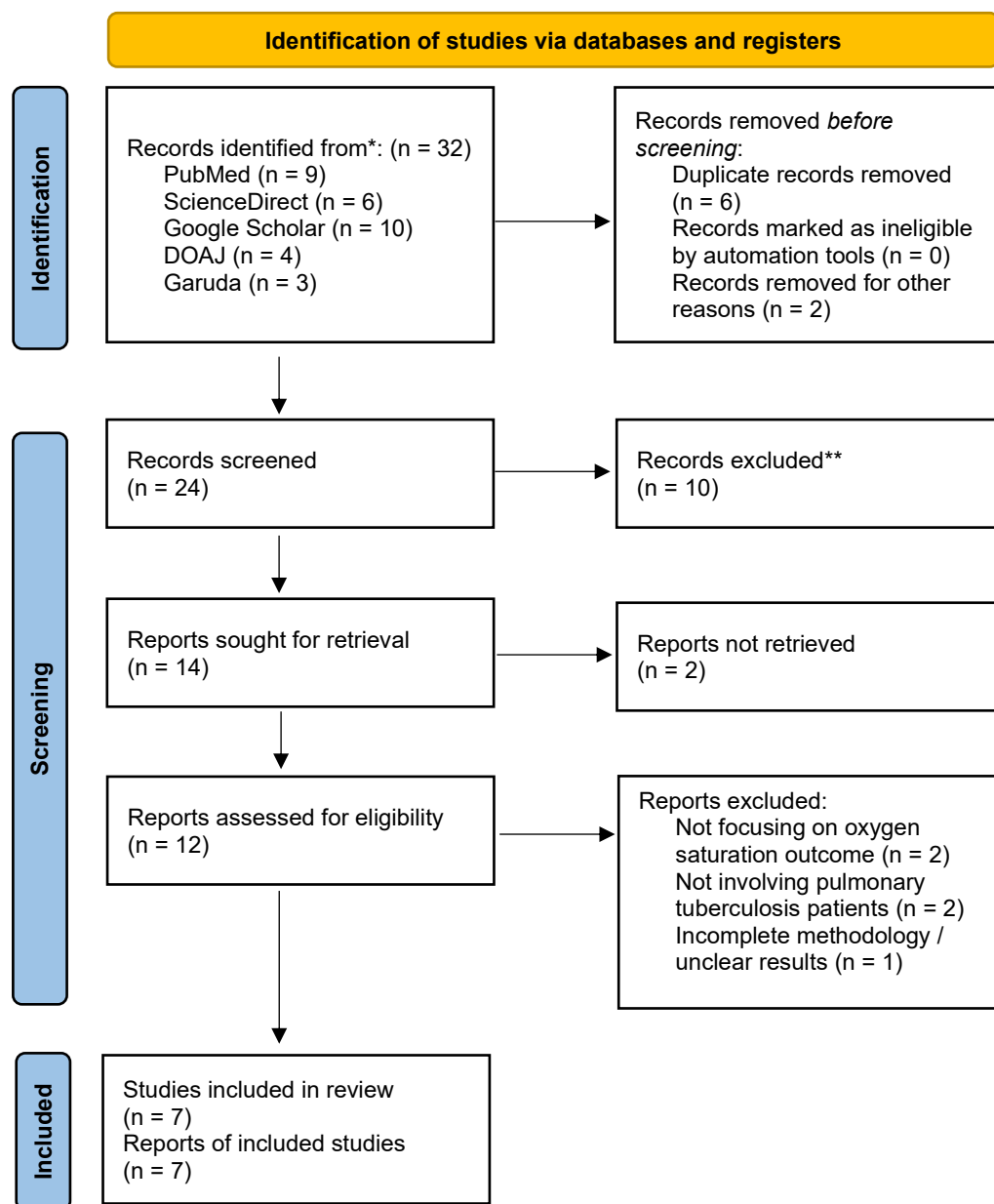


Figure 1. Prisma Flow

RESULT

Table 2: Summary of Included Studies

No	Authors	Country / Population	Main Finding	Themes
1.	Jang et al. (2022)	South Korea / Pulmonary TB patients	Benson and autogenic relaxation improved sleep quality, reduced anxiety, and lowered blood pressure	Breathing exercise; Oxygen saturation; Relaxation
2.	Wu et al. (2024)	China / Pulmonary tuberculosis patients	Pulmonary rehabilitation, including pursed-lip breathing, increased	Pursed-lip breathing;

				oxygen saturation and improved lung function	Pulmonary rehabilitation; Oxygenation
3.	Huang et al. (2025)	China / respiratory patients	Chronic disease	Respiratory training significantly enhanced oxygen saturation and functional capacity	Respiratory training; Oxygen saturation; Functional capacity
4.	Zeng et al. (2025)	China / Pulmonary rehabilitation patients		Music therapy combined with breathing exercises improved oxygenation and reduced anxiety levels	Music therapy; Combined intervention; Oxygenation
5.	Clark et al. (2025)	United Kingdom / Chronic respiratory patients		Music therapy contributed to improved breathing patterns and symptom management	Music therapy; Respiratory control; Symptom relief
6.	Dodange et al. (2024)	Iran / COPD patients		Pursed-lip breathing significantly increased oxygen saturation and reduced respiratory distress	Pursed-lip breathing; Oxygen saturation; Dyspnea reduction
7.	Chadha et al. (2025)	Asia / respiratory programs	Chronic disease	Breathing-based rehabilitation improved oxygen saturation and overall pulmonary outcomes	Pulmonary rehabilitation; Breathing techniques; Oxygenation

This review summarizes evidence from seven selected studies examining the effects of pursed-lip breathing and music therapy on oxygen saturation in patients with pulmonary tuberculosis and other respiratory conditions. The findings are presented thematically to highlight common patterns across studies and to facilitate a clearer understanding of how these interventions influence oxygenation. Three main themes were identified: (1) the role of pursed-lip breathing in oxygenation, (2) the effect of music therapy on respiratory patterns, and (3) the potential synergistic effects of combined interventions.

Theme 1. Pursed-Lip Breathing and Oxygen Saturation

Table 3. Synthesis of Pursed-Lip Breathing Effects

Aspect	Description
Intervention focus	Controlled breathing technique emphasizing prolonged exhalation
Mechanism	Prevents airway collapse, improves ventilation efficiency, and enhances gas exchange
Outcomes	Increased oxygen saturation, reduced dyspnea, improved respiratory stability
Supporting evidence	Found consistently across respiratory conditions, including pulmonary tuberculosis

The synthesis of the included studies shows that pursed-lip breathing consistently contributes to improved oxygen saturation. This technique works by regulating airflow during exhalation, which helps maintain airway patency and supports more effective gas exchange. Across the reviewed literature, improvements in oxygen saturation were often accompanied by reduced respiratory distress and more stable breathing patterns.

Although the overall trend is positive, the magnitude of improvement varies between studies. This suggests that patient-related factors such as disease severity and baseline lung function may influence the effectiveness of the intervention. Overall, pursed-lip breathing appears to be a reliable and accessible strategy for improving oxygenation in clinical practice.

Theme 2. Music Therapy and Respiratory Response

Table 4. Synthesis of Music Therapy Effects

Aspect	Description
Intervention focus	Use of music to induce relaxation and emotional regulation
Mechanism	Modulates autonomic nervous system, reduces anxiety, stabilizes breathing rhythm

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

Outcomes	Improved breathing pattern, reduced stress, indirect improvement in oxygen saturation
Supporting evidence	Observed in pulmonary rehabilitation and chronic respiratory care settings

The reviewed studies indicate that music therapy influences respiratory function primarily through psychological and neurophysiological pathways. Patients exposed to music therapy tend to experience reduced anxiety and improved emotional comfort, which contributes to more regular and controlled breathing patterns.

While the direct impact of music therapy on oxygen saturation is less pronounced compared to breathing exercises, its indirect effects are clinically meaningful. By promoting relaxation, music therapy creates a physiological environment that supports more efficient respiration. This highlights its value as a complementary intervention rather than a standalone treatment.

Theme 3. Combined Effects of Pursed-Lip Breathing and Music Therapy

Table 5. Synthesis of Combined Interventions

Aspect	Description
Intervention focus	Integration of breathing techniques with music-based relaxation
Mechanism	Combines physiological ventilation improvement with psychological regulation
Outcomes	Enhanced oxygen saturation, improved comfort, better adherence to therapy
Supporting evidence	Limited but suggests additive or synergistic benefits

The combination of pursed-lip breathing and music therapy appears to offer a more comprehensive approach to improving oxygen saturation. The included studies suggest that when both interventions are applied together, patients may achieve better outcomes compared to single interventions. This is likely due to the integration of physical and psychological mechanisms.

The synthesis indicates that music therapy may enhance the effectiveness of breathing exercises by reducing anxiety and facilitating a more controlled breathing pattern. In turn, this may improve patient adherence and optimize the physiological benefits of pursed-lip breathing.

However, the number of studies directly examining this combination remains limited. As a result, while the findings are promising, further research is needed to confirm the extent of the synergistic effect.

Across all themes, the evidence suggests that pursed-lip breathing has a more direct effect on oxygen saturation, while music therapy provides supportive benefits through relaxation and autonomic regulation. When combined, these

interventions may complement each other and produce more optimal outcomes in patients with pulmonary tuberculosis.

DISCUSSION

1. Pursed-Lip Breathing and Its Contribution to Oxygenation

The synthesis indicates that pursed-lip breathing contributes to improved oxygen saturation by enhancing ventilatory efficiency and maintaining airway patency during exhalation. This mechanism supports better alveolar ventilation and reduces air trapping, which is particularly relevant in patients with compromised lung function. From a physiological standpoint, the role of controlled expiration in optimizing gas exchange has been well established in respiratory science [8].

However, the extent of its effectiveness appears to vary depending on the severity of lung damage. In cases of advanced pulmonary tuberculosis, structural impairment such as fibrosis and cavitation may limit the capacity for gas exchange despite improved breathing patterns. This highlights a gap between functional improvement and structural limitation. Oxygenation is not solely determined by ventilation but also by perfusion and diffusion processes. Ventilation–perfusion mismatch remains a key factor influencing oxygen saturation, particularly in chronic lung diseases [8,9].

This suggests that while pursed-lip breathing is beneficial, it should be considered a supportive intervention rather than a standalone solution for hypoxemia.

2. Music Therapy and the Psychophysiological Regulation of Breathing

Music therapy appears to influence oxygen saturation indirectly through its effects on psychological and autonomic regulation. Relaxation induced by music can reduce sympathetic activity and promote more stable breathing patterns, which may contribute to improved oxygenation. The relationship between emotional regulation and respiratory control has been widely discussed in psychophysiological research [10,11].

Nevertheless, there is an ongoing debate regarding whether music therapy has a direct physiological effect on oxygen saturation. Some researchers argue that its benefits are primarily mediated through psychological pathways rather than direct respiratory mechanisms. This creates a conceptual gap in understanding its true role in respiratory care.

Neurophysiological models suggest that auditory stimulation can influence limbic system activity and modulate autonomic responses, including breathing patterns [12]. In addition, recent clinical perspectives emphasize that music therapy should be viewed as an adjunctive intervention that enhances patient comfort and reduces stress, rather than directly altering physiological parameters such as oxygen saturation [13].

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

3. Synergistic Potential of Combined Interventions

The integration of pursed-lip breathing and music therapy presents a promising approach that addresses both physiological and psychological aspects of respiratory dysfunction. The combination of these interventions may create conditions that support more effective breathing, as patients are more relaxed and better able to perform controlled breathing techniques.

However, a significant gap remains in the current evidence. Most studies evaluate these interventions separately, and there is limited research specifically examining their combined effects. This raises an important question: whether the observed benefits are truly synergistic or simply additive. From a behavioral medicine perspective, multimodal interventions are often more effective because they target multiple regulatory systems simultaneously. Suggest that integrating physiological and psychological strategies can lead to more sustainable clinical outcomes [14]. However, the success of such approaches depends on patient adherence, which may become a challenge when multiple interventions are introduced.

Therefore, while the theoretical basis for combining pursed-lip breathing and music therapy is strong, further empirical evidence is needed to confirm its clinical effectiveness.

4. Clinical Implications and Theoretical Integration

The findings of this review highlight the importance of a holistic approach in managing pulmonary tuberculosis. Oxygen saturation is influenced not only by pulmonary mechanics but also by psychological and behavioral factors. Integrating breathing techniques with relaxation-based interventions may offer a more comprehensive approach to improving patient outcomes.

At the same time, it is essential to emphasize that these interventions should complement, rather than replace, standard medical treatment. Clinical guidelines consistently recommend a combination of pharmacological therapy and supportive care in the management of respiratory diseases [15].

5. Limitations and Future Directions

Several limitations were identified in this review. First, there is a limited number of studies specifically focusing on pulmonary tuberculosis, with many findings derived from other respiratory conditions. Second, variations in study design and intervention protocols make it difficult to establish standardized recommendations.

Future research should focus on well-designed randomized controlled trials that specifically investigate the combined effects of pursed-lip breathing and music therapy. Standardization of intervention parameters and the use of objective outcome measures will be essential to strengthen the evidence base.

CONCLUSION

This review highlights that pursed-lip breathing and music therapy offer complementary contributions in improving oxygen saturation among patients with pulmonary tuberculosis. Pursed-lip breathing demonstrates a more direct physiological effect by enhancing ventilation efficiency and supporting gas exchange, while music therapy contributes indirectly through psychological relaxation and stabilization of breathing patterns.

An important insight from this review is the potential benefit of combining both interventions. The integration of breathing techniques with music-based relaxation appears to create a more supportive condition for effective respiration, suggesting a synergistic interaction between physiological and psychophysiological mechanisms.

The novelty of this review lies in its integrative perspective, which positions pursed-lip breathing and music therapy not as separate interventions but as a combined non-pharmacological approach that addresses both physical and emotional aspects of respiratory impairment.

In conclusion, the combination of pursed-lip breathing and music therapy has promising potential as a complementary strategy to improve oxygen saturation in pulmonary tuberculosis. However, further well-designed studies are needed to establish standardized protocols and to confirm the extent of their combined effectiveness in clinical practice.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to all individuals who contributed to the completion of this study, particularly for the valuable support, guidance, and insights provided throughout the research process. Appreciation is also extended to previous researchers whose work has contributed to the development of this review.

REFERENCES

- I. Wu D, Wang L, Zhang L. Efficacy and safety of step-by-step Baduanjin exercise based on doctor-nurse-patient integration mode for pulmonary rehabilitation in patients after lobectomy due to pulmonary tuberculosis: a randomized controlled clinical trial. *J Cardiothorac Surg* 2024;19:520. <https://doi.org/10.1186/s13019-024-03042-w>.
- II. Huang N, Peng L, Li H, Si J, Shi L, Wang Y, et al. Meta-Analysis of the Effect of Aerobic Exercise Combined with Respiratory Training on Stable Chronic Obstructive Pulmonary Disease. *COPD J Chronic Obstr Pulm Dis* 2025;22. <https://doi.org/10.1080/15412555.2025.2519598>.
- III. Dodange Z, Darvishpour A, Ershad MJ, Gholami-Chaboki B. Comparison of the Effects of Diaphragmatic Breathing and Pursed-lip Breathing Exercises on the Sleep Quality of Elderly Patients with Chronic Obstructive Pulmonary Disease

Synergistic Effects of Pursed-Lip Breathing and Music Therapy on Oxygen Saturation in Pulmonary Tuberculosis: A Narrative Literature Review

- (COPD): A Clinical Trial Study. *Ther Adv Pulm Crit Care Med* 2024;19. <https://doi.org/10.1177/29768675241302901>.
- IV. Chadha N, Blackstock FC, Smith S, Camp PG, Tang C. Characteristics of rehabilitation programs for chronic respiratory diseases in Asia: A scoping review. *Respir Med* 2025;236:107885. <https://doi.org/10.1016/j.rmed.2024.107885>.
- V. Zeng Q, Lin X, Chen W, Fong DYT, Li J, Li J. Effectiveness of a harmonica-integrated, tele-supervised home-based pulmonary rehabilitation program on lung function and comprehensive health outcomes in patients with chronic obstructive pulmonary disease: a randomized controlled trial protocol. *Front Public Heal* 2025;13. <https://doi.org/10.3389/fpubh.2025.1541866>.
- VI. Ray E, Astles C. An overview of prescribing practice and non-pharmacological treatments in COPD. *J Prescr Pract* 2023;5:250–60. <https://doi.org/10.12968/jprp.2023.5.6.250>.
- VII. Jang K-S, Oh J-E, Jeon G-S. Effects of Simulated Laughter Therapy Using a Breathing Exercise: A Study on Hospitalized Pulmonary Tuberculosis Patients. *Int J Environ Res Public Health* 2022;19:10191. <https://doi.org/10.3390/ijerph191610191>.
- VIII. Bates ML. Respiratory diseases are whole body diseases: opportunities for growth in respiratory physiology. *Am J Physiol Cell Mol Physiol* 2021;321:L628–30. <https://doi.org/10.1152/ajplung.00326.2021>.
- IX. Stana M, Grambozov B, Gaisberger C, Karner J, Ruznic E, Berchtold J, et al. Carbon Monoxide Diffusing Capacity (DLCO) Correlates with CT Morphology after Chemo-Radio-Immunotherapy for Non-Small Cell Lung Cancer Stage III. *Diagnostics* 2022;12:1027. <https://doi.org/10.3390/diagnostics12051027>.
- X. Cheng WL-S, Tang AC-Y, Tsang MC-M, Wong LL-K, Körlin D. Effect of music breathing, a program based on mindful breathing and music listening therapy for promoting sense of coherence in young people: study protocol for a randomized controlled trial. *Trials* 2023;24:662. <https://doi.org/10.1186/s13063-023-07645-x>.
- XI. Pandini I, Lahdji A, Noviasari NA, Anggraini MT. The Effect of Family Social Support and Self Esteem in Improving the Resilience of Tuberculosis Patients. *Media Keperawatan Indones* 2022;5:14. <https://doi.org/10.26714/mki.5.1.2022.14-21>.
- XII. Vuust P, Heggli OA, Friston KJ, Kringelbach ML. Music in the brain. *Nat Rev Neurosci* 2022;23:287–305. <https://doi.org/10.1038/s41583-022-00578-5>.
- XIII. Rodgers-Melnick SN, Bradt J, Jenerette C, Dusek JA. Recommendations for patient-reported outcome use in music therapy practice and research within chronic pain and sickle cell disease populations. *Nord J Music Ther* 2024;33:319–33. <https://doi.org/10.1080/08098131.2024.2316344>.
- XIV. Mailis A, Assimakopoulos D, Lakha SF, Hapidou E. An Integrated Medical and Psychological Approach to Understanding and Assessing Chronic Pain. *Handb. Psychol. Inj. Law*, Cham: Springer Nature Switzerland; 2025, p. 669–93. https://doi.org/10.1007/978-3-031-69734-0_21.
- XV. World Health Organization. Global Tuberculosis Report 2022. *World Heal Organ* 2022. <https://www.who.int/publications/i/item/9789240061729> (accessed March 18, 2026).