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EFFECTIVENESS OF COMMUNITY-BASED INTEGRATED CHAIR AEROBICS AND PULMONARY REHABILITATION PROGRAM ON RESPIRATORY FUNCTION, SLEEP QUALITY AND QUALITY OF LIFE AMONG OLDER ADULTS RESIDING IN OLD AGE HOMES

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ABSTRACT

Background: Physiological changes and chronic illnesses that occur with age are associated with falling respiratory function, decreased quality of sleep, decreased physical abilities and decreased quality of life in older adults living in old age homes.

Objective: To assess the efficacy of community-based integrated (CB-I) chair aerobic exercises and pulmonary rehabilitation (PR) programs on respiratory function, sleep quality and quality of life among older adults.

Methods: The PRISMA guideline was used in conducting a systematic review. PubMed and Google Scholar were used to conduct literature searches with keywords of older adults, chair-based exercise, pulmonary rehabilitation, respiratory function, sleep quality and quality of life. Seventy-nine (791) records were identified and, following the removal of duplicates, screening and eligibility assessment, 12 studies were included in the final review.

Results: The studies included in this review showed that pulmonary rehabilitation, respiratory muscle training, breathing exercises, and home-based rehabilitation interventions could enhance the respiratory performance, exercise tolerance, functional capacity, and health-related quality of life. The community-based and tele-rehabilitation models were found to be highly feasible and accessible, especially for older individuals who are mobility impaired.

Conclusion: Chair aerobics combined with PR could be a viable and effective method to improve respiratory function, sleep quality and quality of life in older people. More RCTs in the old age home environment are required to confirm long-term success and guidelines for implementation.

KEYWORDS: Chair aerobics, pulmonary rehabilitation, older adults, respiratory function, sleep quality, quality of life

1. INTRODUCTION

Population ageing is happening at a rapid pace, with more older people experiencing functional limitations, sleep disturbances, reduced quality of life, and respiratory impairments, and more of these conditions being chronic. Physiological changes, such as decreased lung elasticity, weakened respiratory muscle function, and decreased pulmonary reserve, that occur with age are factors that compromise lung function and make people more susceptible to chronic respiratory diseases. Of these, chronic obstructive pulmonary disease (COPD) is one of the most important causes of disability and decreased wellness in elderly people (CHEN et al., 2025; Maddocks et al., 2016). To this end, interventions that will help support respiratory health, physical functioning and overall health and well-being are now a critical part of healthy aging strategies. Pulmonary rehabilitation (PR) is established as one of the very important non-pharmacological measures in COPD. Modern PPR programs consist of exercise training, education, self-management support, and behavioral modification techniques to enhance physical and psychological outcomes (Holland et al., 2021; Rochester et al., 2023). International guidelines focus on the benefits of pulmonary rehabilitation for people with COPD and other chronic respiratory conditions, including increased exercise capacity, decreased dyspnea, improved respiratory function and better health-related quality of life (Alison et al., 2017; Zhou et al., 2025). Moreover, exercise and supportive rehabilitation programs are known to have beneficial effects on functional capacity and well-being, with the combined use of these programs showing the most promising results (Jácome & Marques, 2017; Korkmaz et al., 2020). Although it has been shown to be effective, the participation in traditional pulmonary rehabilitation is relatively low. Some challenges are transportation, limited rehabilitation facilities, mobility challenges and accessibility issues for older people. In response to these challenges, alternative rehabilitation models like home-based rehabilitation, telerehabilitation and web-based rehabilitation programs have been developed. There is evidence that these can enhance access to rehabilitation services whilst maintaining clinical effectiveness (Bernocchi et al., 2018; Bourne et al., 2017; Chaplin et al., 2017). Furthermore, some interventions that use technology to deliver rehabilitation, such as telerehabilitation and mobile health,

have proven to be effective tools in promoting adherence to long-term rehabilitation and engagement in community settings (Cox et al., 2021; Wootton et al., 2023). The main focus of pulmonary rehabilitation is exercise training and a number of ancillary strategies have been developed for improvement of respiratory outcomes. Inspiratory muscle training, breathing exercises and structured respiratory muscle conditioning have been shown to improve respiratory muscle strength and exercise capacity, and have a beneficial impact on quality of life for patients with chronic respiratory diseases (Beaumont et al., 2015; Yun et al., 2021). Other breathing strategies include diaphragmatic breathing and pursed-lip breathing, which have been found to improve respiratory efficiency and sleep quality among older adults with COPD (Blondeel et al., 2018; Dodange et al., 2024). Furthermore, there is evidence from systematic reviews that the addition of exercise interventions to pulmonary rehabilitation could provide additional benefits for respiratory and functional outcomes (Camillo et al., 2016; Zheng et al., 2022). Old age individuals living in long-term care and old age homes may have a number of other conditions that make it difficult for them to perform in standard exercise programs, such as frailty, balance problems, limited mobility, and several comorbidities. It has been shown that chair-based exercise can positively influence physical functioning, muscular strength, mobility and psychological well-being in older adults (Efendi et al., 2023; Klempel et al., 2021). Recent studies indicate that the development of pulmonary rehabilitation and breathing-related interventions can yield beneficial outcomes on sleep quality, through improved breathing function and reduced symptom burden (Dai & Kwok, 2025; Dodange et al., 2024). Better sleep quality can then help promote physical, psychological and social health. While there is significant evidence for the benefits of pulmonary rehabilitation and research to support the use of chair-based programs has grown, few studies have integrated evidence to demonstrate the benefits of combining the two approaches in older adults in old age homes. Main objective is to assess the impact of community-based integrated programs of chair aerobics and pulmonary rehabilitation on respiratory function, sleep quality, and quality of life for older adults. To determine the feasibility, adherence factors and potential benefits of implementing such interventions in old age home setting**.** Moreover, rehabilitation participation and adherence barriers remain to have an impact on intervention effectivenes. The purpose of this systematic literature review is to compare the efficacy of community-based integrated chair exercise and pulmonary rehabilitation on improvement in respiratory function, sleep quality and quality of life among older adults and offer evidence-based recommendations to support rehabilitation practice and healthy aging programming.

2. METHODOLOGY

2.1 Review Design

This systematic review aimed to identify evidence concerning community-based pulmonary rehabilitation, chair-based or seated exercise, respiratory muscle training, sleep quality, respiratory function and quality of life in older adults and in populations with compromised respiratory function. The screening process for the review was structured, following the PRISMA guidelines, in order to ensure the transparent identification, screening, evaluation of eligibility and inclusion of studies.

2.2 Search Strategy

PubMed and Google Scholar databases were used to systemically search for literature. The additional articles were identified by manually scanning relevant articles for the presence of further studies. The search was conducted using Medical Subject Headings (MeSH) and keywords related to older adults, chair-based exercise, pulmonary rehabilitation, respiratory function, sleep quality and quality of life. The search string for PubMed was:

(("Aged"[Mesh] OR elderly OR "older adult*" OR geriatric) AND ("chair exercise*" OR "chair aerobics" OR "chair-based exercise*" OR "seated exercise*" OR "pulmonary rehabilitation" OR "respiratory rehabilitation" OR "breathing exercise*") AND ("quality of life" OR "sleep quality" OR "respiratory function" OR "pulmonary function") NOT (children OR adolescent OR athlete* OR pregnancy))

The search was limited to English-language, peer-reviewed publications that included rehabilitation, respiratory health, sleep outcomes, quality-of-life measures, and were relevant to the study.

2.3 Study Identification

791 records were found. Of all of these studies, 600 records were recovered from databases, such as PubMed and Google Scholar, and 191 records were obtained by manually checking references and other sources. 301 records were left after removing 490 duplicate records.

2.4 Screening Process

301 records were screened with titles and abstracts, based on the objectives of the review. Twenty-one records were removed during this phase due to a lack of relevance to the scope of pulmonary rehabilitation, respiratory function, sleep quality, quality of life, and older adult/community based rehabilitation contexts. The records were then screened for full-text and totaling 100 records.

2.5 Eligibility Criteria

Studies were eligible for inclusion if they targeted pulmonary rehabilitation, respiratory muscle training, breathing exercises, seated or chair-based exercise, respiratory function, sleep quality, quality of life, patient experience, rehabilitation compliance or chronic respiratory disease management. Qualitative and quantitative studies were included. When findings were relevant to the review outcomes, older adults, COPD patients, chronic respiratory disease patients, post-COVID respiratory recovery, post-tuberculosis lung impairment or other respiratory-compromised populations were

included in the studies. Studies were excluded if they did not meet all of the following criteria: not relevant to the topic of the review (respiratory rehabilitation or relevant respiratory outcomes); outside the scope of healthcare; not available in full text; duplicates or overlapping publications; or were excluded due to language barriers.

2.6 Included Studies

Final study consisted of 12 qualitative and quantitative studies. The studies included in this review addressed pulmonary rehabilitation knowledge, attitudes and practices, adherence to rehabilitation, home pulmonary rehabilitation, remote pulmonary rehabilitation, inspiratory and expiratory muscle training, inspiratory/expiratory muscle training using harmonica, lung function impairment, impact on quality of life due to insomnia, and respiratory recovery pathways. The studies included were variously designed, such as qualitative studies, cross-sectional surveys, feasibility studies, prospective studies, mixed-method research, and case-based evidence.

2.7 Data Extraction

A structured format was used for extracting data. Information recorded was author's name, year of publication, country, study design, sample size, study population, intervention or focus areas, outcome variables and key findings. The primary outcomes obtained included respiratory function, participation in pulmonary rehabilitation, sleep quality, quality of life, exercise capacity, dyspnea, patients' perceptions, adherence, and feasibility of pulmonary rehabilitation.

2.8 Data Synthesis

Given the variation in the design of the studies, the population studied, type of intervention, and the measure of the outcomes, a narrative synthesis approach was used. The studies included were classified thematically as related to respiratory function, pulmonary rehabilitation, sleep quality, quality of life, adherence to rehabilitation, and/or patient experience. The findings were analyzed based on the topic of the proposed review integrated chair aerobics and pulmonary rehabilitation among older adults living in old age homes.

2.9 Ethical Consideration

This study did not involve any human participants since the study was systematic literature review based on published studies. Thus there was no formal ethics approval required. All included studies were, however, reviewed, and reported in an academic way, and the process of selecting studies was reported transparently by using PRISMA flow diagram.

3. RESULTS

3.1 Study Selection

A systematic search found 791 records in electronic databases and elsewhere. After duplicate removal and screening, full text articles were reviewed on 100 articles. During the selection based on the eligibility criteria, 12 studies were selected for final synthesis. Study present the selection process in the PRISMA flow diagram. The process of selection of studies is presented in Figure 1, according to the PRISMA framework, showing how studies were identified, screened, assessed for eligibility and included.

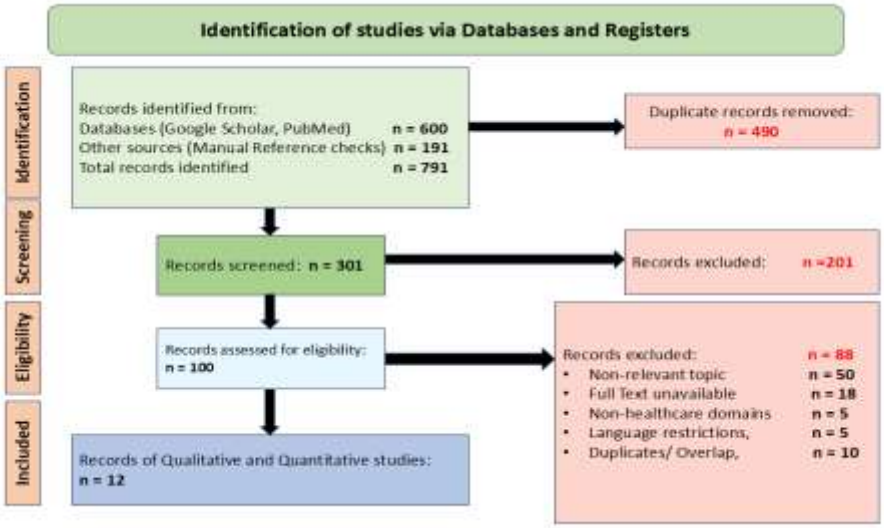

Figure 1. PRISMA Flow Diagram Showing Identification, Screening, Eligibility, and Inclusion of Studies

The studies included were conducted from 2015 to 2026 and were from various geographical areas such as China, India, Bangladesh, Pakistan, Spain, Poland, the United Kingdom, and a few European countries. Qualitative and quantitative evidence were included to give a full picture of the effects of pulmonary rehabilitation, respiratory training, sleep and quality of life outcomes.

3.2 Characteristics of Included Studies

A description of the characteristics of the 12 studies included in the analysis is given in Table 1. The studies were carried out in several countries, such as the UK, Spain, Poland, Pakistan, Bangladesh, and China, and included a range of studies

from qualitative investigations to cross sectional surveys, feasibility studies, mixed-method studies, and prospective analysis.

Table 1. Characteristics of Included Studies

Author (Year)	Country	Design	Sample Size	Population	Main Focus
(Sheraz et al., 2026)	Pakistan	Qualitative	12	Diabetic polyneuropathy patients	Inspiratory muscle training
(Li et al., 2026)	China	Cross-sectional	150	Older adults with COPD	PR knowledge, attitudes, practices
(Navaneethapandian et al., 2026)	India	Cross-sectional	132	Post-TB patients	Lung function impairment
(W. Chen et al., 2026)	China	Qualitative	19	COPD patients	Harmonica-based respiratory intervention
(Briggs et al., 2025)	UK	Cohort evaluation	PHOSP-COVID cohort	Post-COVID patients	Rehabilitation pathways
(He et al., 2026)	China	Case report	1	Lung cancer patient with COPD	Preoperative pulmonary rehabilitation
(Miądlikowska et al., 2025)	Poland	Prospective	69	IPAF and AIRD-ILD patients	Disease progression
(Sparks et al., 2025)	UK	Feasibility study	10	Post-laryngectomy patients	Expiratory muscle training
(Almonacid et al., 2025)	Spain	Qualitative	28	COPD and asthma patients	Support needs
(Xia et al., 2025)	China	Cross-sectional	100	Stable COPD patients	PR compliance
(Habib et al., 2025)	Bangladesh	Mixed-method	51	Chronic respiratory disease patients	Remote PR
(Royant-Parola et al., 2025)	Europe	Survey	755	Adults with insomnia	Sleep and quality of life

3.3 Distribution of Study Designs and Populations

Several methodological techniques were used in the review. The most common design was cross-section studies (n = 3) and there were also qualitative studies (n = 3). Most studies were on COPD and chronic respiratory disease populations. Table 2 provides an overview of the methodological distribution and target population of the studies included. The most prevalent types of available evidence were cross-sectional and qualitative and the most common population studied were COPD patients.

Table 2. Distribution of Study Designs and Target Populations

Variable	Frequency (n)	Percentage (%)
Cross-sectional studies	3	25.0
Qualitative studies	3	25.0
Feasibility studies	1	8.3
Prospective studies	1	8.3
Mixed-method studies	1	8.3
Cohort evaluations	1	8.3
Case reports	1	8.3
Survey studies	1	8.3
COPD populations	5	41.7
Chronic respiratory disease populations	2	16.7
Other respiratory populations	5	41.6

This is because the majority of studies focused on COPD are related to the effectiveness of pulmonary rehabilitation in the management of COPD.

3.4 Respiratory Function Outcomes

Pulmonary rehabilitation, inspiratory muscle training, expiratory muscle training, breathing exercises, and respiratory recovery interventions were directly analyzed in eight studies focusing on respiratory function. The benefits of pulmonary rehabilitation and interventions directed at the respiratory system on respiratory function are summarized in Table 3. Most

studies revealed improvements in pulmonary function, respiratory muscle strength, respiratory control, exercise capacity, and functional respiratory outcomes.

Table 3. Effects on Respiratory Function

Study	Intervention	Respiratory Outcome	Main Finding
(Sheraz et al., 2026)	Inspiratory muscle training	Breathing capacity	Improved breathing efficiency
(Navaneethapandian et al., 2026)	Lung function assessment	FEV1/FVC	Identified significant impairment
(W. Chen et al., 2026)	Harmonica intervention	Breathing control	Improved respiratory control
(He et al., 2026)	Pulmonary rehabilitation	FEV1	Increased from 1.20 L to 1.64 L
(Sparks et al., 2025)	EMST	Peak flow, FEV1, MEP	Significant improvements
(Habib et al., 2025)	Remote PR	Exercise tolerance	Improved functional capacity
(Xia et al., 2025)	PR participation	Respiratory management	Better adherence associated with outcomes
(Briggs et al., 2025)	Post-COVID rehabilitation	Respiratory recovery	Improved recovery pathway outcomes

In the overall analysis, all pulmonary rehabilitation and respiratory muscle training intervention groups exhibited significant improvements in respiratory performance, exercise tolerance, breathing control, and pulmonary function indicators.

3.5 Sleep Quality and Quality of Life Outcomes

Seven studies had reported outcomes in terms of sleep quality, psychosocial well-being or quality of life. Evidence related to sleep quality and quality-of-life outcomes is presented in Table 4. The results show that rehabilitation-based programs not only lead to physiological but also to psychological health, sleep quality, social engagement, and the quality of life improvement.

Table 4. Sleep Quality and Quality of Life Outcomes

Study	Outcome Domain	Findings	Quantitative Findings
(Sheraz et al., 2026)	Quality of life	Improved physical and mental well-being	n = 12 participants
(W. Chen et al., 2026)	Sleep quality and QoL	Better sleep and social participation	n = 19 participants
(He et al., 2026)	Quality of life	Good QoL maintained at follow-up	FEV1 improved from 1.20 L to 1.64 L
(Sparks et al., 2025)	Voice-related QoL	Improved communication perception	n = 10 participants
(Habib et al., 2025)	HRQoL	Significant improvement beyond MCID	83% achieved clinically meaningful HRQoL improvement; 86% completed ≥70% sessions
(Almonacid et al., 2025)	Patient-reported QoL	PR identified as major unmet need	n = 28 participants
(Royant-Parola et al., 2025)	Sleep and QoL	Insomnia negatively affected daily functioning	n = 755 respondents

It is indicated that rehabilitation based interventions are not limited to physiological gains, but also have a positive effect on psychological well being, social interaction, communication and quality of life.

3.6 Pulmonary Rehabilitation Participation, Adherence, and Patient Perspectives

A total of five studies investigated the factors affecting the participation, adherence, awareness and patient experiences regarding pulmonary rehabilitation. Table 5 provides an overview of the variables affecting the involvement in pulmonary rehabilitation, compliance, and perceptions in patients. The findings suggest that accessibility and motivation, awareness and program feasibility are important predictors of rehabilitation engagement and long-term adherence.

Table 5. Pulmonary Rehabilitation Participation and Patient Perspectives

Study	Focus Area	Quantitative Findings	Major Findings
(Li et al., 2026)	PR knowledge and attitudes	n = 150 participants	Positive attitudes but low practice levels
(Xia et al., 2025)	PR compliance	n = 100 participants	Compliance influenced by exercise habits and self-efficacy

(Habib et al., 2025)	Remote PR feasibility	86% completed ≥70% sessions	High feasibility and adherence
(Almonacid et al., 2025)	Patient support needs	Qualitative evidence	Need for multidisciplinary rehabilitation support
(W. Chen et al., 2026)	Patient experiences	Qualitative evidence	Positive perceptions of respiratory activities

The results show that awareness, motivation, accessibility and program simplicity are key determinants of successful rehabilitation attendance. Home-based and community-based programs showed good feasibility and compliance.

3.7 Summary of Findings

The overall evidence shows that pulmonary rehabilitation and respiratory exercise interventions are beneficial to respiratory function, functional capacity and quality of life. The results were improved in various groups, such as COPD patients, those with chronic respiratory disease, and post-surgical patients, and post-COVID cohorts. Moreover, the use of patient-based rehabilitation strategies enhanced compliance and engagement, as well as psychosocial outcomes. Lower quality of sleep was less often analyzed and displayed positive patterns in case respiratory functioning and the general well-being had improved. These results affirm the possible importance of combining a chair-based exercise and pulmonary rehabilitation approach in the community and residential care environment to improve the respiratory health, sleep quality, and quality of life in older adults.

4. DISCUSSION

The current systematic literature review study summarised the evidence on pulmonary rehabilitation, respiratory training interventions, chair based exercise methods, and other associated rehabilitation interventions that can lead to better respiratory function, sleep quality and quality of life in older adults and people with chronic respiratory conditions. The results continually prove that pulmonary rehabilitation is one of the most productive non-pharmacological treatment methods to improve respiratory health, physical functioning, and psychosocial outcomes among a variety of patients.

One of the significant discoveries of this review is the positive impact of pulmonary rehabilitation on respiratory system and exercise capacity. Pulmonary rehabilitation has been demonstrated to increase the performance of the lungs, decrease the symptom burden, and boost the level of physical activity in people with COPD and other chronic respiratory diseases (Puhan et al., 2016; Ryrsø et al., 2018). These advantages can be largely explained by the fact that structured exercise training, respiratory muscle conditioning and self-management education are in effect. The positive changes in physical activity attendance in response to telecoaching and rehabilitation programs also justify the role of rehabilitation in enhancing respiratory health in the long term (Demeyer et al., 2017). In the same vein, an increase in exercise motivation and engagement in exercise activities among patients undergoing rehabilitation programs has been linked to improved functional outcomes and management of the disease (Mesquita et al., 2017). Another significant aspect of the review is the significance of respiratory muscle training and interventions based on breathing. There is some indication that inspiratory muscle training, breathing exercises, and respiratory rehabilitation methods help to improve respiratory muscle strength, exercise tolerance, and overall quality of life (Wallaert et al., 2015; Yun et al., 2021).

Diaphragmatic and pursed-lip breathing exercises have been mentioned to enhance symptom management and breathing efficiency as well as favorable sleep outcomes in people with chronic respiratory illnesses (Dodange et al., 2024; Marques et al., 2019). Moreover, interventions centered on breathing have been shown to have positive impacts beyond respiratory conditions, indicating the presence of more physiological and psychological advantages of certain breathing techniques (Qiu et al., 2020). The other significant observation is the increased efficacy of home-based and telehealth rehabilitation models.

Conventional center-based pulmonary rehabilitation is usually hindered by accessibility, transport and mobility issues, especially in the elderly. Some of the articles in this review showed that home-based rehabilitation and tele-rehabilitation have the potential to produce similar results compared to traditional rehabilitation interventions, with some progressing accessibility and compliance (Bernocchi et al., 2018; Bourne et al., 2017; Cox et al., 2021). Tele-rehabilitation involving home-based maintenance has been found to decrease acute exacerbation, hospitalization, and emergency department visits of COPD patients (Vasilopoulou et al., 2017). In the same way, tele-rehabilitation interventions have proved to be feasible in survivors of COVID-19, which implies that they can be used in more general respiratory rehabilitation settings (Paneroni et al., 2022).

The results also show that pulmonary rehabilitation does not only improve respiratory capabilities but also significantly helps in enhancing psychological health and quality of life. There is evidence that pulmonary rehabilitation may help decrease anxiety and depression symptoms and improve the overall well-being (Gordon et al., 2019). This symptom-based method is consistent with current viewpoints that consider COPD and other respiratory diseases as multidimensional illnesses that need a holistic approach to management (Burge et al., 2020; Machado et al., 2021). Psychological well-being improvements might also be indirectly associated with the increase in the quality of sleep and the adherence to rehabilitation. Chair-based exercise interventions can be considered a rather topical rehabilitation strategy in the case of older adults who live in old age homes and long-term care facilities. Past experience proves that chair-based exercise interventions can enhance physical functioning, mobility, and psychosocial outcomes in older adults (Efendi et al., 2023; Klempel et al., 2021).

The beneficial effects of complementary exercise modalities like Tai Chi and mind-body movement therapies have also been shown to have positive impacts on the respiratory and functional outcomes, which underscores the importance of

adaptable exercise interventions in respiratory rehabilitation (Y.-W. Chen et al., 2016; Ngai et al., 2016; Saey et al., 2018). It has been identified that the involvement in early pulmonary rehabilitation positively affects the reduction of the risk of hospital readmission and leads to better clinical outcomes (Kjærgaard et al., 2020).

The use of interventions that encourage physical activity and the long-term participation in the process of rehabilitation is, thus, necessary to achieve maximum benefits. Taken together, the data show that community-based chair aerobics and pulmonary rehabilitation is a potentially effective solution to enhancing the respiratory function, sleep, and quality of life of older adults, especially those living in residential care facilities where the main factors are the accessibility and safety.

5. CONCLUSION

The systematic review of literature has investigated the efficacy of pulmonary rehabilitation, respiratory training interventions, and exercise-based rehabilitation interventions on enhancing the respiratory performance, sleep quality, and the quality of life in the older adults and persons with long-standing respiratory conditions. The results suggest that pulmonary rehabilitation is a very efficient non-pharmacological treatment that leads to improvements in respiratory performance, exercise capacity, functional independence and psychosocial status. Additional evidence in the form of home-based and community-based rehabilitation programs and tele-rehabilitation programs show that available rehabilitation models are able to effectively facilitate patient involvement and adherence at the long term. Other respiratory-oriented interventions such as breathing exercises and inspiratory muscle training and other respiratory-oriented interventions have been also identified in the study to be beneficial in strengthening respiratory muscles, decreasing the burden of symptoms as well as improving overall health outcomes. Moreover, interventions based on exercise, such as chair-based exercise interventions, seem to be especially useful in older adults with mobility issues, providing a safe and effective way to exercise in residential care facilities. Though there is no specific evidence that specifically investigates the role of integrated chair aerobics against pulmonary rehabilitation in older adults in old age homes, the existing literature has indicated a potential synergistic effect of the two interventions on the respiratory health, sleep quality, and quality of life. These programs can help solve several age-related issues at the same time and help people age healthily and gain functional independence. Further studies must be done to include well-designed randomized controlled trials in old age homes to measure the long-term effectiveness of integrated chair aerobics and pulmonary rehabilitation programs and to develop evidence-based guidelines to be used in the community and residential care environment.

REFERENCES

1. Alison, J. A., McKeough, Z. J., Johnston, K., McNamara, R. J., Spencer, L. M., Jenkins, S. C., Hill, C. J., McDonald, V. M., Frith, P., Cafarella, P., Brooke, M., Cameron-Tucker, H. L., Candy, S., Cecins, N., Chan, A. S. L., Dale, M. T., Dowman, L. M., Granger, C., Halloran, S., … on behalf of the Lung Foundation Australia and the Thoracic Society of Australia and New Zealand. (2017). Australian and N ew Z ealand P ulmonary R ehabilitation G uidelines. *Respirology*, *22*(4), 800–819. https://doi.org/10.1111/resp.13025
2. Almonacid, C., Gómez, R., Morán, I., Muerza, I., Pastor, M., Garcia-Esparcia, P., García, E., Soria, C., Lázaro, E., & Querol, D. (2025). Support Needs of Patients with Chronic Obstructive Pulmonary Disease (COPD) and Asthma Throughout Their Patient Journey: A Qualitative Study. *International Journal of Chronic Obstructive Pulmonary Disease*, *20*, 2639–2658. https://doi.org/10.2147/COPD.S526548
3. Beaumont, M., Mialon, P., Ber-Moy, C. L., Lochon, C., Péran, L., Pichon, R., Gut-Gobert, C., Leroyer, C., Morelot-Panzini, C., & Couturaud, F. (2015). Inspiratory muscle training during pulmonary rehabilitation in chronic obstructive pulmonary disease: A randomized trial. *Chronic Respiratory Disease*, *12*(4), 305–312. https://doi.org/10.1177/1479972315594625
4. Bernocchi, P., Vitacca, M., La Rovere, M. T., Volterrani, M., Galli, T., Baratti, D., Paneroni, M., Campolongo, G., Sposato, B., & Scalvini, S. (2018). Home-based telerehabilitation in older patients with chronic obstructive pulmonary disease and heart failure: A randomised controlled trial. *Age and Ageing*, *47*(1), 82–88.
5. Blondeel, A., Demeyer, H., Janssens, W., & Troosters, T. (2018). The role of physical activity in the context of pulmonary rehabilitation. *COPD: Journal of Chronic Obstructive Pulmonary Disease*, *15*(6), 632–639. https://doi.org/10.1080/15412555.2018.1563060
6. Bourne, S., DeVos, R., North, M., Chauhan, A., Green, B., Brown, T., Cornelius, V., & Wilkinson, T. (2017). Online versus face-to-face pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: Randomised controlled trial. *BMJ Open*, *7*(7), e014580.
7. Briggs, A. H., Ibbetson, A., Walters, A., Houchen-Wolloff, L., Armstrong, N., Emerson, T., Gill, R., Hastie, C., Little, P., Overton, C., Pimm, J., Poinasamy, K., Singh, S., Walker, S., Leavy, O. C., Richardson, M., Elneima, O., McAuley, H., Shikotra, A., … Evans, R. A. (2025). Clinical and cost-effectiveness of diverse posthospitalisation pathways for COVID-19: A UK evaluation using the PHOSP-COVID cohort. *BMJ Open Respiratory Research*, *12*(1), e003224. https://doi.org/10.1136/bmjresp-2025-003224
8. Burge, A. T., Cox, N. S., Abramson, M. J., & Holland, A. E. (2020). Interventions for promoting physical activity in people with chronic obstructive pulmonary disease (COPD). *Cochrane Database of Systematic Reviews*, (4). https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD012626.pub2/abstract
9. Camillo, C. A., Osadnik, C. R., Van Remoortel, H., Burtin, C., Janssens, W., & Troosters, T. (2016). Effect of "add-on" interventions on exercise training in individuals with COPD: A systematic review. *ERJ Open Research*, *2*(1). https://publications.ersnet.org/content/erjor/2/1/00078-2015.abstract

10. Chaplin, E., Hewitt, S., Apps, L., Bankart, J., Pulikottil-Jacob, R., Boyce, S., Morgan, M., Williams, J., & Singh, S. (2017). Interactive web-based pulmonary rehabilitation programme: A randomised controlled feasibility trial. *BMJ Open*, *7*(3), e013682.
11. CHEN, D., LONG, H., ZHANG, C., CHU, L., LI, S., & CHEN, Y. (2025). Interpretation of global strategy for the diagnosis, treatment, management and prevention of chronic obstructive pulmonary disease 2025 report. *Chinese General Practice*, *28*(16), 1937.
12. Chen, W., Huang, J., Zeng, Q., Ye, Z. J., Li, J., & Li, J. (2026). Patient perspectives on harmonica playing as an intervention for chronic obstructive pulmonary disease: A qualitative study. *BMJ Open*, *16*(2), e112115. https://doi.org/10.1136/bmjopen-2025-112115
13. Chen, Y.-W., Hunt, M. A., Campbell, K. L., Peill, K., & Reid, W. D. (2016). The effect of Tai Chi on four chronic conditions—cancer, osteoarthritis, heart failure and chronic obstructive pulmonary disease: A systematic review and meta-analyses. *British Journal of Sports Medicine*, *50*(7), 397–407.
14. Cox, N. S., Dal Corso, S., Hansen, H., McDonald, C. F., Hill, C. J., Zanaboni, P., Alison, J. A., O'Halloran, P., Macdonald, H., & Holland, A. E. (2021). Telerehabilitation for chronic respiratory disease. *Cochrane Database of Systematic Reviews*, (1). https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD013040.pub2/abstract
15. Dai, S., & Kwok, C. S. (2025). The impact of pulmonary rehabilitation on sleep quality in patients with chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Plos One*, *20*(6), e0318424.
16. Demeyer, H., Louvaris, Z., Frei, A., Rabinovich, R. A., de Jong, C., Gimeno-Santos, E., Loeckx, M., Buttery, S. C., Rubio, N., & Van der Molen, T. (2017). Physical activity is increased by a 12-week semiautomated telecoaching programme in patients with COPD: A multicentre randomised controlled trial. *Thorax*, *72*(5), 415–423.
17. Dodange, Z., Darvishpour, A., Ershad, M. J., & Gholami-Chaboki, B. (2024). Comparison of the Effects of Diaphragmatic Breathing and Pursed-lip Breathing Exercises on the Sleep Quality of Elderly Patients with Chronic Obstructive Pulmonary Disease (COPD): A Clinical Trial Study. *Therapeutic Advances in Pulmonary and Critical Care Medicine*, *19*, 29768675241302901. https://doi.org/10.1177/29768675241302901
18. Efendi, F., Tonapa, S. I., Has, E. M. M., & Ho, K. H. M. (2023). Effects of chair-based resistance band exercise on physical functioning, sleep quality, and depression of older adults in long-term care facilities: Systematic review and meta-analysis. *International Journal of Nursing Sciences*, *10*(1), 72–81.
19. Gordon, C. S., Waller, J. W., Cook, R. M., Cavalera, S. L., Lim, W. T., & Osadnik, C. R. (2019). Effect of pulmonary rehabilitation on symptoms of anxiety and depression in COPD: A systematic review and meta-analysis. *Chest*, *156*(1), 80–91.
20. Habib, G. M. M., Uzzaman, N., Rabinovich, R., Akhter, S., Sultana, M., Ali, M., Pinnock, H., & RESPIRE Collaboration. (2025). Delivering remote pulmonary rehabilitation in Bangladesh: A mixed-method feasibility study. *Journal of Global Health*, *15*, 04002. https://doi.org/10.7189/jogh.15.04002
21. He, X., Jiang, J., long, H., & Liang, H. (2026). Left lung combined segmentectomy for lung cancer with displaced left B1+2. *Journal of Cardiothoracic Surgery*, *21*(1), 178. https://doi.org/10.1186/s13019-026-03945-w
22. Holland, A. E., Cox, N. S., Houchen-Wolloff, L., Rochester, C. L., Garvey, C., ZuWallack, R., Nici, L., Limberg, T., Lareau, S. C., & Yawn, B. P. (2021). Defining modern pulmonary rehabilitation. An official American Thoracic Society workshop report. *Annals of the American Thoracic Society*, *18*(5), e12–e29.
23. Jácome, C., & Marques, A. (2017). Computerized Respiratory Sounds: Novel Outcomes for Pulmonary Rehabilitation in COPD. *Respiratory Care*, *62*(2), 199–208. https://doi.org/10.4187/respcare.04987
24. Kjærgaard, J., Juhl, C. B., Lange, P., & Wilcke, T. (2020). Adherence to early pulmonary rehabilitation after COPD exacerbation and risk of hospital readmission: A secondary analysis of the COPD-EXA-REHAB study. *BMJ Open Respiratory Research*, *7*(1). https://bmjopenrespres.bmj.com/content/7/1/e000582
25. Klempel, N., Blackburn, N. E., McMullan, I. L., Wilson, J. J., Smith, L., Cunningham, C., O'sullivan, R., Caserotti, P., & Tully, M. A. (2021). The effect of chair-based exercise on physical function in older adults: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, *18*(4), 1902.
26. Korkmaz, C., Demirbas, S., Vatansev, H., Yildirim, E., Teke, T., & Zamani, A. (2020). Effects of comprehensive and intensive pulmonary rehabilitation and nutritional support on quality of life and functional status in patients with chronic obstructive pulmonary disease. *Journal of International Medical Research*, *48*(4), 0300060520919567. https://doi.org/10.1177/0300060520919567
27. Li, T.-Y., Hu, Y.-H., Wang, J., & Hu, W.-Y. (2026). Knowledge, attitudes, and practices related to pulmonary rehabilitation and associated influencing factors among older adults with chronic obstructive pulmonary disease in a county medical community. *Frontiers in Public Health*, *14*, 1781124. https://doi.org/10.3389/fpubh.2026.1781124
28. Machado, A., Marques, A., & Burtin, C. (2021). Extra-pulmonary manifestations of COPD and the role of pulmonary rehabilitation: A symptom-centered approach. *Expert Review of Respiratory Medicine*, *15*(1), 131–142. https://doi.org/10.1080/17476348.2021.1854737
29. Maddocks, M., Kon, S. S., Canavan, J. L., Jones, S. E., Nolan, C. M., Labey, A., Polkey, M. I., & Man, W. D. (2016). Physical frailty and pulmonary rehabilitation in COPD: A prospective cohort study. *Thorax*, *71*(11), 988–995.
30. Marques, A., Jácome, C., Rebelo, P., Paixão, C., Oliveira, A., Cruz, J., Freitas, C., Rua, M., Loureiro, H., Peguinho, C., Marques, F., Simões, A., Santos, M., Martins, P., André, A., De Francesco, S., Martins, V., Brooks, D., & Simão, P. (2019). Improving access to community-based pulmonary rehabilitation: 3R protocol for real-world settings with cost-benefit analysis. *BMC Public Health*, *19*(1), 676. https://doi.org/10.1186/s12889-019-7045-1

31. Mesquita, R., Nakken, N., Janssen, D. J., van den Bogaart, E. H., Delbressine, J. M., Essers, J. M., Meijer, K., van Vliet, M., de Vries, G. J., & Muris, J. W. (2017). Activity levels and exercise motivation in patients with COPD and their resident loved ones. *Chest*, *151*(5), 1028–1038.
32. Miądlikowska, E., Miłkowska-Dymanowska, J., Białas, A., Makowska, J., Lewandowska-Polak, A., Łacwik, P., & Piotrowski, W. (2025). Predictors of 1-year progression of interstitial lung disease in patients with interstitial pneumonia with autoimmune features: A single-center, prospective study. *Polish Archives of Internal Medicine*. https://doi.org/10.20452/pamw.17115
33. Navaneethapandian, P., Sarma, P. S., Rajendran, M., & Thankappan, K. R. (2026). Lung Function Impairment and Its Associated Factors in Pulmonary Tuberculosis Patients Upon Treatment Completion in Madurai District, Tamil Nadu: A Cross-Sectional Study. *Cureus*, *18*(2), e103941. https://doi.org/10.7759/cureus.103941
34. Ngai, S. P., Jones, A. Y., & San Tam, W. W. (2016). Tai Chi for chronic obstructive pulmonary disease (COPD). *Cochrane Database of Systematic Reviews*, (6).
https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009953.pub2/abstract
35. Paneroni, M., Vitacca, M., Bernocchi, P., Bertacchini, L., & Scalvini, S. (2022). Feasibility of tele-rehabilitation in survivors of COVID-19 pneumonia. *Pulmonology*, *28*(2), 152–154. https://doi.org/10.1016/j.pulmoe.2021.03.009
36. Puhan, M. A., Gimeno-Santos, E., Cates, C. J., & Troosters, T. (2016). Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, (12). https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD005305.pub4/abstract
37. Qiu, K., Wang, J., Chen, B., Wang, H., & Ma, C. (2020). The effect of breathing exercises on patients with GERD: A meta-analysis. *Annals of Palliative Medicine*, *9*(2), 40513–40413.
38. Rochester, C. L., Alison, J. A., Carlin, B., Jenkins, A. R., Cox, N. S., Bauldoff, G., Bhatt, S. P., Bourbeau, J., Burtin, C., & Camp, P. G. (2023). Pulmonary rehabilitation for adults with chronic respiratory disease: An official American Thoracic Society clinical practice guideline. *American Journal of Respiratory and Critical Care Medicine*, *208*(4), e7–e26.
39. Royant-Parola, S., Poirot, I., & Geoffroy, P. A. (2025). Impact of insomnia: Cultural and societal aspects from a European survey. *L'Encéphale*, *51*(6), 643–650. https://doi.org/10.1016/j.encep.2025.01.004
40. Ryrsø, C. K., Godtfredsen, N. S., Kofod, L. M., Lavesen, M., Mogensen, L., Tobberup, R., Farver-Vestergaard, I., Callesen, H. E., Tendal, B., Lange, P., & Iepsen, U. W. (2018). Lower mortality after early supervised pulmonary rehabilitation following COPD-exacerbations: A systematic review and meta-analysis. *BMC Pulmonary Medicine*, *18*(1), 154. https://doi.org/10.1186/s12890-018-0718-1
41. Saey, D., Maltais, F., & Lacasse, Y. (2018). Active mind-body movement therapies as an adjunct to or in comparison with pulmonary rehabilitation for people with chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, (10). https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD012290.pub2/abstract
42. Sheraz, S., Malik, A. N., Ferraro, F. V., & Siddiqi, F. A. (2026). Multifactorial Inspiratory Muscle Training in Patients With Diabetic Polyneuropathy: A Qualitative Study. *Journal of Diabetes Research*, *2026*, 6670842.
https://doi.org/10.1155/jdr/6670842
43. Sparks, F., Coffey, M., Dipper, L., Crowther, J., Hamilton, S., Occomore-Kent, L., & Hilari, K. (2025). Expiratory Muscle Strength Training to Improve Voice and Respiratory Outcomes After Laryngectomy: A Feasibility Study. *International Journal of Language & Communication Disorders*, *60*(5), e70107.
https://doi.org/10.1111/1460-6984.70107
44. Vasilopoulou, M., Papaioannou, A. I., Kaltsakas, G., Louvaris, Z., Chynkiamis, N., Spetsioti, S., Kortianou, E., Genimata, S. A., Palamidas, A., & Kostikas, K. (2017). Home-based maintenance tele-rehabilitation reduces the risk for acute exacerbations of COPD, hospitalisations and emergency department visits. *European Respiratory Journal*, *49*(5). https://publications.ersnet.org/content/erj/49/5/1602129.abstract
45. Wallaert, B., Grosbois, J.-M., Gicquello, A., Langlois, C., Le Rouzic, O., Chenivesse, C., & Bart, F. (2015). Long-term evaluation of home-based pulmonary rehabilitation in patients with COPD. *International Journal of Chronic Obstructive Pulmonary Disease*, 2037. https://doi.org/10.2147/COPD.S90534
46. Wootton, S. L., Dale, M. T., Alison, J. A., Brown, S., Rutherford, H., Chan, A. S., Varnfield, M., Yang, I. A., Cunich, M., & Dennis, S. (2023). Mobile health pulmonary rehabilitation compared to a center-based program for cost-effectiveness and effects on exercise capacity, health status, and quality of life in people with chronic obstructive pulmonary disease: A protocol for a randomized controlled trial. *Physical Therapy*, *103*(7), pzad044.
47. Xia, X., Xia, K., Yao, X., Song, J., Liu, Y., Liu, X., Zhang, H., & Li, G. (2025). Factors Influencing Compliance with Pulmonary Rehabilitation in Patients with Stable COPD: A Cross Sectional Study. *International Journal of Chronic Obstructive Pulmonary Disease*, *20*, 895–904. https://doi.org/10.2147/COPD.S506248
48. Yun, R., Bai, Y., Lu, Y., Wu, X., & Lee, S.-D. (2021). How Breathing Exercises Influence on Respiratory Muscles and Quality of Life among Patients with COPD? A Systematic Review and Meta-Analysis. *Canadian Respiratory Journal*, *2021*, 1–11. https://doi.org/10.1155/2021/1904231
49. Zheng, J., Zhang, Z., Han, R., Zhang, H., Deng, J., & Chai, M. (2022). Effects of exercise-based home pulmonary rehabilitation on patients with chronic obstructive pulmonary disease: An overview of systematic review. *Plos One*, *17*(11), e0277632.
50. Zhou, H., Li, C., Niu, F., Liu, W., Qiu, X., Yang, G., Zhang, H., & Yan, J. (2025). Barriers and facilitators to adherence to home-based pulmonary rehabilitation in patients with chronic obstructive pulmonary disease: A mixed-methods systematic review. *BMC Nursing*, *24*(1), 1279. https://doi.org/10.1186/s12912-025-03940-x