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## Effectiveness of non-pharmacological interventions in managing dyspnea among cancer patients: A systematic review

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### Abstract

**Background:** The management of dyspnea in cancer patients still faces various challenges. Non-pharmacological interventions are increasingly recognized as effective, potentially cost-effective, and effective approaches to managing this symptom.

**Purpose:** To identify, evaluate, and analyze evidence regarding the effectiveness of non-pharmacological interventions in managing dyspnea in cancer patients.

**Method:** This systematic review followed PRISMA guidelines and conducted a literature search across five databases (Sage Journals, PubMed, ScienceDirect, Springerlink, and Google Scholar). Inclusion criteria included English-language articles published between 2015 and 2025, with a randomized controlled trial (RCT) or cohort study design. From 59,225 articles identified, 11 studies met the inclusion criteria for analysis.

**Results:** A total of 1,369 cancer patients were analyzed across 10 RCTs and one cohort study. Various non-pharmacological interventions proven effective in managing dyspnea include Tai Chi, aerobic exercise, Respiratory Distress Symptom Intervention (RDSI), Inspiratory Muscle Training (IMT), home-based education programs, and acupuncture.

**Conclusion:** Non-pharmacological interventions can be an important component in the management of dyspnea in cancer patients, significantly contributing to symptom reduction and overall patient well-being.

**Keywords:** Cancer; Dyspnea; Non-pharmacological Interventions.

### INTRODUCTION

Dyspnea or breathlessness is a subjective experience characterized by an abnormal sensation of breathing that varies in intensity. This symptom can be caused by various interacting factors, including physiological, psychological, social, and environmental factors (Yates, Hardy, Clavarino, Fong, Mitchell, Skerman, & Zhao, 2020; Zhang, Wang, Chen, & Yuan, 2016). In the cancer context, dyspnea often be the main complaint, especially patients with advanced cancer or those requiring palliative care, with a prevalence reaching 70% (Choratas, Papastavrou, Charalambous, & Kouta, 2020). In lung cancer patients, this prevalence can reach to 90% (Takemura, Cheung, Fong, Hui, Lee, Lam, & Lin, 2024). The impact of dyspnea is very

significant, not only physically but also psychologically and socially, affecting disease prognosis and can lead to severe physical disability, loss of independence, diminished individual dignity, social isolation, and a poor prognosis (Takemura et al., 2024).

Dyspnea is a disturbing and debilitating condition for cancer patients, causing difficulty breathing, anxiety, and limitations in physical activity, resulting in a decreased quality of life (Vo, Ta, & Chuang, 2025). Furthermore, dyspnea is known to be a complex symptom in its evaluation and treatment, where with varying levels of perceived thresholds for breathing discomfort and the severity disease not always directly related to the intensity of symptoms

experienced (Yates et al., 2020). Despite of its high prevalence and significant impact on patient quality of life, effective dyspnea management remains a neglected clinical challenge (Takemura et al., 2024). Therefore, the American Society of Clinical Oncology (ASCO) recommends a stepwise approach to dyspnea management, including non-pharmacological interventions that proven effectively with minimum side effects, alongside of pharmacological therapy as the primary intervention (Sakai, Yamaga, Yamamoto, Matsumori, Ichiyama, Hanaoka, & Horiuchi, 2023).

Dyspnea for some cancer patients still be unresolved despite the implementation of various medical intervention strategies. The multidimensional nature of dyspnea suggests that non-pharmacological methods can be an important complement to the management of this symptom (Yates et al., 2020). In the current era, non-pharmacological interventions are increasingly recognized as an important option in the management of dyspnea in cancer patients. These approaches are believed to improve patient comfort and quality of life without relying on medication (Yorke, Johnson, Punnett, Smith, Blackhall, Williams, & Molassiotis, 2022; Gupta, Sedhom, Sharma, Zhang, Waldfogel, Feliciano, & Dy, 2021). These approaches encompass a variety of techniques, from simple self-administered techniques to integrative therapies and palliative care (Wahyuningsih, Afiyanti, Waluyo, & Fitch, 2023). Although promising, the effectiveness of non-pharmacological interventions varies, and consensus on the most optimal interventions for cancer patients remains elusive. Further research is needed to evaluate and identify the most effective methods for managing dyspnea.

## RESEARCH METHOD

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The review systematically identified and selected relevant studies, followed by a critical appraisal of their methodological quality and findings. This structured approach enabled the researchers to draw more objective conclusions regarding the effectiveness of non-pharmacological interventions for reducing dyspnea among cancer patients.

A comprehensive literature search was carried out across five electronic databases: Sage Journals,

Google Scholar, PubMed, ScienceDirect, and SpringerLink. Search terms were formulated using relevant keywords and Medical Subject Headings (MeSH), including “cancer/neoplasm/malignancy/oncology,” “non-pharmacological intervention,” and “dyspnea/ breathlessness/shortness of breath.”

A purposive search strategy was employed to identify studies focusing on dyspnea among cancer patients and to collect evidence on the effectiveness of non-pharmacological interventions. The inclusion criteria were: (1) studies addressing dyspnea in patients with any type of cancer; (2) publications dated between 2015 and 2025; (3) English-language articles; (4) full-text availability; and (5) research designs limited to randomized controlled trials (RCTs) or cohort studies. The exclusion criteria included: (1) studies unrelated to dyspnea or non-pharmacological interventions in cancer patients; (2) unavailability of full-text articles; and (3) publications prior to 2015. Articles meeting the criteria were selected after a full-text review, and their quality was evaluated using the Critical Appraisal Skills Programme (CASP) checklist.

The study did not develop or modify its own evaluation instrument but instead utilized the existing CASP tool to assess the methodological rigor of included studies. The CASP checklist, known for its validity and reliability, was used to rate each study as “present,” “absent,” or “unclear” based on eligibility criteria. Studies rated as methodologically sound were included in the final analysis, while those of low quality were excluded.

The search initially identified 59,225 articles. After removing duplicates and applying automated filters, 58,838 articles were excluded. The remaining 387 articles were screened by title and abstract, yielding 91 for full-text review. Following further evaluation, 11 studies met all inclusion criteria and were included in the final review (see Figure 1). Collectively, these studies involved 1,369 cancer patients experiencing dyspnea. Of these, 10 studies used an RCT design, while one employed a cohort approach. All studies focused on patients with lung cancer, with sample sizes ranging from 12 to 263 participants. The research was conducted across various countries, including Hong Kong, the United Kingdom, Japan, Cyprus, the United States, and Australia.

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## RESEARCH RESULTS

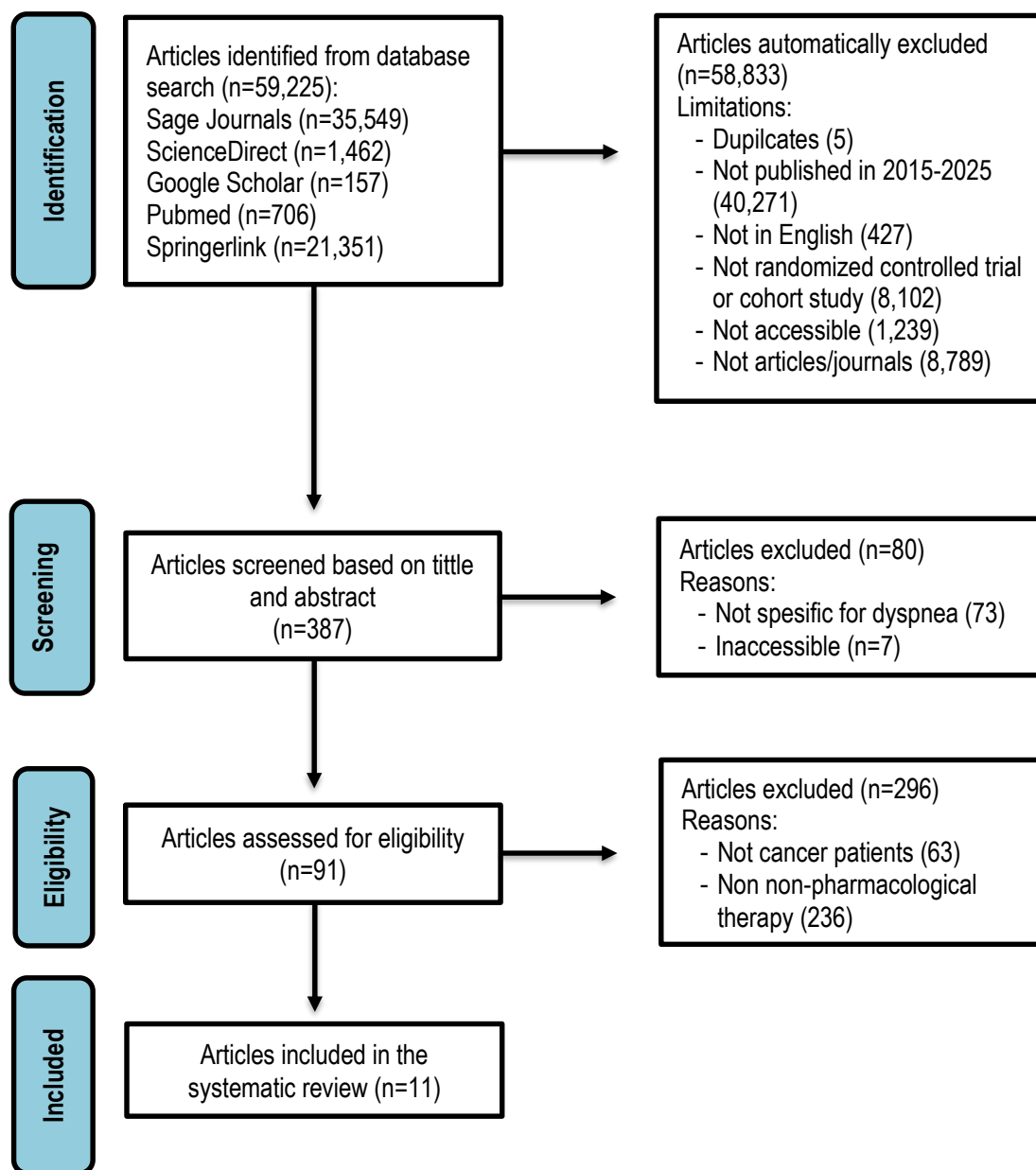


Figure PRISMA Flowchart

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**Table Summary of the Reviewed Articles**

| (Author, Year)<br>(Country)            | Method | Purpose                                                                                                                               | Sample and<br>population                   | Intervention (Mechanism,<br>Duration, Frequency)                                                                                                                                                                                                                          | Measuring<br>instrument                                                                                                                     | Key Findings                                                                                                                                                                                                                                                                                 |
|----------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Takemura et al., 2024)<br>(Hong Kong) | RCT    | To determine the effectiveness of Tai Chi and aerobic exercise to overcome dyspnea in advanced lung cancer.                           | Stage IIIB-IV lung cancer patients (n=226) | <ul style="list-style-type: none"> <li>• Tai Chi: slow-moving breathing exercises, 60 minutes, twice a week, 16 weeks.</li> <li>• Aerobic exercise: walking on a treadmill and strength training, 60 minutes, twice a month + self-training at home, 16 weeks.</li> </ul> | <ul style="list-style-type: none"> <li>• EORTC QLQ-C30 (whole dyspnea)</li> <li>• EORTC QLQ-LC13 (dyspnea, lung cancer specific)</li> </ul> | <ul style="list-style-type: none"> <li>• Tai Chi</li> <li>- Whole dyspnea in T1 (p=0,03) and T2 (p=0,01)</li> <li>- Specific dyspnea in T2 (p&lt;0,001).</li> <li>• Aerobic exercise:</li> <li>- Whole dyspnea in T1(p=0,08), T2 (p=0,32)</li> <li>- Specific dyspnea T2 (p=0,01)</li> </ul> |
| (Yorke et al., 2022)<br>(UK)           | RCT    | To assess the effectiveness of Respiratory Distress Symptom Intervention (RDSI) in managing symptom clusters in lung cancer patients. | Lung cancer patients (n=263)               | A combination of breathing exercises, upper cough techniques, acupressure, and light activity for 12 weeks. Breathing exercises and acupressure should be performed at least twice daily; physical exercise should be done according to ability.                          | Dyspnoea Questionnaire-12 (D-12)                                                                                                            | There was a significant improvement in dyspnea in the 12th week of intervention (p=0.007)                                                                                                                                                                                                    |
| (Minchom et al., 2016)<br>(UK)         | RCT    | To assess the effectiveness of acupuncture in relieving breathless in patients with lung cancer.                                      | Lung cancer patients (n=173)               | Acupuncture at the sternal, paraspinal, trapezius, and LI4 points, plus semi-permanent stud needles in the sternum (massaged during shortness of breath/activity). Duration 10 minutes, frequency once, 14-day monitoring.                                                | <ul style="list-style-type: none"> <li>• VAS Dyspnoea</li> <li>• Borg Dyspnoea Scale</li> </ul>                                             | 4-hour reduction in scores: acupuncture: (-2.62), morphine (-2.66), combination (-2.86). There was no significant difference between groups (p=0.142).                                                                                                                                       |

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| (Author, Year)<br>(Country)         | Method       | Purpose                                                                                                                                             | Sample and<br>population                   | Intervention (Mechanism,<br>Duration, Frequency)                                                                                                                              | Measuring<br>instrument                                                                                                 | Key Findings                                                                                                                                                                                                                                                            |
|-------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Sakai et al., 2023)<br>(Japan)     | Cohort Study | To investigate the effectiveness of inspiratory muscle training (IMT) in advanced lung cancer patients with dyspnea.                                | Advanced stage lung cancer patients (n=66) | Breathing exercises with the POWERbreathe device to strengthen inspiratory muscles. Duration: 20–40 minutes per session. Frequency: twice a day, 5 times a week, for 2 weeks. | <ul style="list-style-type: none"> <li>Modified Borg Scale (mBS)</li> <li>Maximal Inspiratory Pressure (MIP)</li> </ul> | <ul style="list-style-type: none"> <li>Dyspnea at rest: significantly decreased in weeks 1 and 2 (p&lt;0.01)</li> <li>Dyspnea on exertion: significantly decreased in weeks 1 and 2 (p&lt;0.01)</li> <li>MIP: significantly increasing every week(p&lt;0,01)</li> </ul> |
| (Johnson et al., 2015)<br>(UK)      | RCT          | To evaluate the effectiveness of three breathing exercise sessions compared to one session in managing shortness of breath in lung cancer patients. | Lung cancer patients (n=156)               | Breathing exercises, muscle relaxation, anxiety management, activity rhythm regulation, duration 60 minutes, frequency: 1 or 3 time a week                                    | Numerical Rating Scale (NRS) 0–10                                                                                       | Dyspnea scores decreased clinically in both groups (1x and 3x), with no significant difference between frequencies (p=0.83)                                                                                                                                             |
| (Choratas et al., 2020)<br>(Cyprus) | RCT          | To evaluate the effectiveness of a nurse-led home-based education program in the management of breathlessness in lung cancer patients.              | Lung cancer patients and families (n=19)   | Dyspnea education, diaphragmatic breathing exercises, BMI, and hand fanning. Duration 30–50 minutes, twice (weeks 0 and 2), 4-week monitoring.                                | <ul style="list-style-type: none"> <li>Modified Borg Scale (mBorg)</li> <li>VAS</li> <li>Breathlessness</li> </ul>      | <ul style="list-style-type: none"> <li>Distress due to dyspnea (VAS): significantly improved (F=9,87, p&lt;0,001)</li> <li>Dyspnea (mBorg): moderate but not significant decrease (p=0,097)</li> <li>Dyspnea at worst (VAS): not significant (p=0,153)</li> </ul>       |

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|-------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Yates et al., 2020)<br>(Australia) | RCT    | To assess the effectiveness of breathing training and psychosocial support on dyspnea in cancer patients                                                                             | Lung cancer patients (n=144) | Breathing exercises, education, and psychosocial support, 60-minute face-to-face sessions + 3x telephone calls (15 minutes/week) for 4 weeks                                                                                   | Scale NRS 0–10                                                                                      | <ul style="list-style-type: none"> <li>• Average breathless improved significantly (p=0,018)</li> <li>• The worst breathless was not significant (p=0,70)</li> <li>• Breathless control improved significantly (p=0,001)</li> </ul>                                                        |
| (Yorke et al., 2015)<br>(UK)        | RCT    | To test the effectiveness of RDSI in managing symptoms of shortness of breath, cough, and fatigue in lung cancer patients.                                                           | Lung cancer patients (n=107) | Breathing exercises, cough relief techniques, 6-point acupressure, fatigue and anxiety management education, 2 face-to-face sessions (60 minutes) and once by phone call. Frequency for 4 weeks, follow-up for up to 12 weeks. | <ul style="list-style-type: none"> <li>• Dyspnoea-12</li> <li>• NRS 0–10</li> </ul>                 | <ul style="list-style-type: none"> <li>• Dyspnea improved significantly at week 12 (p=0.026) Mean and worst dyspnea were not significantly different between groups (p&gt;0.2).</li> <li>• Distress due to shortness of breath decreased significantly in the 4th week (p=0.02)</li> </ul> |
| (Molassiotis et al., 2015)<br>(UK)  | RCT    | To evaluate the effectiveness of Inspiratory Muscle Training in overcoming shortness of breath, psychological stress, and improving the quality of life of thoracic cancer patients. | Lung cancer patients (n=47)  | Inspiratory muscle training using a threshold inspiratory muscle trainer for 30 minutes a day, frequency 5 time a week for 12 weeks                                                                                            | <ul style="list-style-type: none"> <li>• Modified Borg Scale (mBorg)</li> <li>• NRS 0–10</li> </ul> | Dyspnea improved at T2 (p=0.029), worst dyspnea was lower at T3 (p=0.003), dyspnea distress was lower at T3 (p=0.018), and mean dyspnea was lower at T3 (p=0.019).                                                                                                                         |

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| (Author, Year)<br>(Country)               | Method | Purpose                                                                                                                | Sample and<br>population     | Intervention (Mechanism,<br>Duration, Frequency)                                                                                                                                                                        | Measuring<br>instrument                                                                                                     | Key Findings                                                                                         |
|-------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Molassiotis et al., 2021)<br>(Hong Kong) | RCT    | To evaluate the effectiveness of Qigong therapy for shortness of breath, fatigue, and anxiety in lung cancer patients. | Lung cancer patients (n=156) | 90 minutes of body movement, deep breathing, and light meditation, twice a week for the first two weeks, followed by 30 minutes of independent practice five times a week for four weeks. Follow-up for up to 12 weeks. | <ul style="list-style-type: none"> <li>• Cancer Dyspnoea Scale (CDS)</li> <li>• EORTC QLQ-LC13</li> </ul>                   | Significant improvement in dyspnea at week 6 (p=0.002), Significant improvement at week 12 (p=0.014) |
| (Bauml et al., 2016)<br>(USA)             | RCT    | To evaluate the effectiveness of acupuncture for dyspnea in lung cancer patients.                                      | Lung cancer patients (n=12)  | Acupuncture on chest and back points for 15–20 minutes, 10 sessions a week, monitoring 4 weeks after therapy                                                                                                            | <ul style="list-style-type: none"> <li>• Numerical Rating Scale (NRS) 0–10</li> <li>• Cancer Dyspnea Scale (CDS)</li> </ul> | Breathlessness decreased at the end of therapy (p=0.003)                                             |

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## DISCUSSION

This systematic review aimed to evaluate the effectiveness of various non-pharmacological interventions in managing dyspnea in cancer patients. Eleven analyzed articles demonstrated high quality, with adequate methodology, clear reporting, and an acceptable risk of bias. These articles consisted of diverse study designs: one article used a cohort design, while the other ten adopted a randomized controlled clinical trial (RCT). These design differences contributed to variations in the findings, with cohort studies used to identify associations between exposure and outcomes, while RCTs focused more on testing the effects of interventions on treatment and control groups.

Quality assessment using the CASP instrument revealed that most studies did not implement participant or provider blinding. However, the majority employed validated measurement tools and provided detailed methodological reporting, thereby contributing valuable evidence to nursing practice. Based on intervention type, the included studies were categorized into five groups: structured physical exercise, structured respiratory training, respiratory muscle training, home-based education programs, and acupuncture.

### Structured Physical Exercise

A research tested two types of structured physical exercise, Tai Chi and aerobic exercise, to reduce symptoms of shortness of breath (dyspnea) in patients with advanced lung cancer. The results showed that Tai Chi, performed twice in week for 16 weeks, significantly reduced shortness of breath. This improvement was seen both after 16 weeks (T1) with a score reduction of -8.69 ( $p=0.03$ ) compared to the control group, and after eight months (T2) with a score reduction of -11.45 ( $p=0.01$ ). On the other hand, structured aerobic exercise, which involved moderate-intensity exercise and prominent muscle strengthening, as well as independent home exercises, also successfully reduced shortness of breath in patients. At T2, the improvement was -11.04 ( $p=0.01$ ) compared to the control group. However, the improvement in this group was not as significant as the improvement seen in the Tai Chi group (Takemura et al., 2024).

### Structured Respiratory Exercises

A research examined the effectiveness of the Respiratory Distress Symptom Intervention (RDSI) in managing dyspnea symptoms in lung cancer patients. One of the main components of the RDSI is structured respiratory exercises, which involved diaphragmatic respiratory and pursed-lip breathing techniques. This technique is practiced twice daily or as needed to relieve the symptoms of shortness of breath that often occur in lung cancer patients. Results from this trial showed that the group receiving the RDSI experienced significant improvements in dyspnea, as measured by the Dyspnoea-12 (D-12). The RDSI group showed better scores compared to the control group, with a significant improvement ( $p=0.007$ ). This is similar with a study which reported significant improvements in dyspnea after implementing the RDSI. Measurements using the Dyspnoea-12 showed further improvements in the RDSI group compared to the control group, with a significant  $p$ -value ( $p=0.007$ ). This strengthens the findings of previous research, that structured respiratory exercises in RDSI can be an effective and non-pharmacological solution to reduce the symptoms of dyspnea experienced by lung cancer patients (Yorke, Lloyd-Williams, Smith, Blackhall, Harle, Warden, & Molassiotis, 2015).

### Respiratory Muscle Training

Five articles examined the effectiveness of respiratory muscle training in managing dyspnea in cancer patients, including inspiratory muscle training (IMT) and Qigong. Several studies showed that inspiratory muscle training (IMT) significantly reduced dyspnea, both at rest ( $p<0.01$ ) and during activity ( $p<0.01$ ) (Sakai et al., 2023). This finding aligns with a study which also found that respiratory muscle training significantly reduced dyspnea, even with a single intervention (Johnson, Kanaan, Richardson, Nabb, Torgerson, English, & Booth, 2015). A significant reduction in dyspnea ( $p=0.018$ ) was reported after implementing respiratory muscle training (Yates et al., 2020).

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Furthermore, a study noted significant improvements in dyspnea ( $p=0.029$ ) after patients underwent respiratory muscle training (Molassiotis, Charalambous, Taylor, Stamatakis, & Summers, 2015). Another study who used Qigong therapy as a solution to overcome dyspnea in cancer patients also showed a significant reduction in dyspnea after the intervention ( $p=0.002$ ) (Molassiotis, Vu, & Ching, 2021).

### Home-Based Education Program

A study evaluated a nurse-led home-based education program for managing dyspnea in lung cancer patients. The program included breathing exercises and the use of a hand-held fan. Results showed that dyspnea decreased significantly in the intervention group ( $p<0.001$ ), with a median decrease on the mBorg scale from 5.9 ( $\pm 1.6$ ) to 5.1 ( $\pm 2.6$ ), while it increased in the control group ( $p=0.228$ ). Dyspnea-related distress also decreased in the intervention group ( $p<0.001$ ), with an improvement from 7.4 ( $\pm 1.5$ ) to 6.0 ( $\pm 2.3$ ). Furthermore, patient anxiety levels decreased in the intervention group ( $p=0.027$ ), while they increased in the control group ( $p=0.532$ ). The burden levels of caregiver family also showed significant improvement in the intervention group ( $p=0.007$ ). Although there were no significant changes in lung function, the program proved effective in reducing patients' symptoms of dyspnea and anxiety (Choratas et al., 2020).

### Acupuncture

Two studies have examined the use of acupuncture to treat dyspnea in lung cancer patients, both demonstrated acupuncture's potential as an effective non-pharmacological therapy. They involved 12 patients who received 10 acupuncture sessions for ten weeks. The results showed a significant reduction in dyspnea, with NRS dyspnea scores dropping from 6.3 at baseline to 3.6 at the end of treatment ( $p=0.003$ ) and 3.2 at follow-up ( $p=0.008$ ). This decrease indicates that acupuncture can significantly reduce dyspnea symptoms in lung cancer patients. Furthermore, there were significant improvements in fatigue and quality of life, as reflected in improved Brief Fatigue Inventory (BFI) scores ( $p<0.05$ ) and Functional Assessment of Cancer Therapy–Lung version (FACT-L) scores

( $p<0.05$ ) (Bauml, Haas, Simone, Li, Cohen, Langer, & Mao, 2016).

A randomized phase II study was conducted with 173 patients divided into three groups: acupuncture, morphine, and a combination of acupuncture and morphine. The results showed that acupuncture was effective in reducing dyspnea, with 74% of patients in the acupuncture group reporting a decrease of 1.5 points or more on the Visual Analogue Scale (VAS) within 4 hours of treatment, compared with 60% in the morphine group and 66% in the combination group. Although there was no significant difference between the three groups ( $p=0.12$ ), acupuncture was shown to significantly reduce anxiety ( $p=0.003$ ) and increase relaxation ( $p<0.001$ ). In addition, the group receiving only acupuncture (arm A) required a lower dose of morphine compared with the groups receiving only morphine (arm M) or the combination (arm AM) (Minchom, Punwani, Filshie, Bhosle, Nimako, Myerson, & O'Brien, 2016).

The cohort study design has several advantages that make it a popular choice in health research. One advantage is its ability to track developments longitudinally, allowing researchers to calculate the incidence of events and their relative risks over time. Although this design cannot directly prove causal relationships, due to its observational nature, cohort studies still provide strong evidence of the relationship between existing risk factors and observed health outcomes (Wang & Kattan, 2020). On the other hand, the randomized controlled trial (RCT) design has advantages in measuring the efficacy of an intervention. RCTs can achieve a better balance between experimental and control groups, both in terms of measurable and non-measurable characteristics. This allows RCTs to provide more reliable causal evidence and be a more appropriate method for assessing the effects of an intervention on the subjects studied (Fernainy, Cohen, Murray, Losina, Lamontagne, & Sourial, 2024).

Analysis of these eleven articles revealed a variety of non-pharmacological interventions implemented for dyspnea management in cancer patients. These interventions reflect a flexible clinical approach and can be tailored to each patient's condition and preferences. Most interventions have been shown to be effective in reducing dyspnea levels. One intervention studied is structured physical

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exercise, such as Tai Chi, and aerobic exercise, aimed at improving respiratory status. Tai Chi, with its slow movements, balanced posture, and deep breathing, helps increase alveolar ventilation, improve lung function, and enhance tissue oxygenation. This activity also activates respiratory muscles such as the diaphragm and intercostal muscles, contributing to increased tidal volume and reduced dyspnea. Furthermore, deep breathing stimulates the parasympathetic nervous system and decreases sympathetic activity, which has been shown to be effective in relieving the sensation of breathlessness (Takemura et al., 2024; Dittus, Gramling, & Ades, 2017).

On the other hand, aerobic exercise is known to be effective in increasing cardiorespiratory capacity, specially by improving the efficiency of gas exchange in the body and increasing tolerance for more strenuous physical activity. Aerobic exercise can strengthen the heart and lungs, allowing individuals to do their daily activities better without makes them feel exhausted. However, in patients with advanced cancer, higher-intensity aerobic exercise carries the risk of excessive exhaustion, which can make patient's physical condition be worse. These results caused less optimal effectiveness of aerobic exercise compared to relaxation-based interventions such as Tai Chi, which tend to be lower in intensity and provide psychophysiological benefits without overburdening the body. Both interventions, although different in approach, are fundamentally based on the principle of optimal ventilation-perfusion (V/Q matching), which aims to maximize the efficiency of gas exchange between the lungs and blood. Furthermore, both functions are also to desensitize the respiratory center to hypercapnic and hypoxic stimuli, which are often problematic in patients with chronic respiratory disorders (Takemura et al., 2024).

Respiratory Distress Symptom Intervention (RDSI) is a structured breathing exercise that combines various breathing techniques and sensory therapies to help manage dyspnea symptoms. This intervention includes diaphragmatic breathing, pursed-lip breathing, cough control, acupressure, and symptom management education to improve patients' quality of life. Diaphragmatic breathing and pursed-lip breathing exercises have been shown to effectively improve alveolar ventilation by increasing airflow to deeper lung areas and prolonging the

expiratory phase. Furthermore, this technique can also reduce respiratory rate, which in turn reduces the air trapping phenomenon that often occurs in patients with chronic lung disease. Cough control techniques play a crucial role in clearing the airways, allowing air and mucus to escape more effectively, and improving airway patency. Furthermore, acupressure provides sensory stimulation to specific points directly connected to the respiratory center in the medulla oblongata and the brain's limbic system. This stimulation can reduce the tightness and anxiety that often accompany difficulty breathing. All the mechanisms involved in RDSI align with the principles of sensory-perceptual neuromodulation, where the simultaneous of multisensory stimuli can push the activity of the breathless perception center, so it provides a calm effect and improve respiratory control (Yorke et al., 2022).

Respiratory muscle training such as inspiratory muscle training (IMT) and Qigong operate on the principles of inspiratory muscle loading and neuromuscular adaptation. IMT provides additional inspiratory loading, which trains the respiratory muscles, increasing their strength and endurance. This process ultimately leads to increased efficiency, which in turn improves tidal volume, stabilizes respiratory rate, and reduces the work of breathing. Consequently, these interventions can reduce the perception of shortness of breath often experienced by patients with respiratory disorders. Qigong, on the other hand, operates on similar principles, but places greater emphasis on a mind-body approach that integrates breathing with physical and emotional relaxation, providing a calming effect that is highly beneficial for the patient's overall well-being (Johnson et al., 2015; Molassiotis et al., 2015; Sakai et al., 2023).

The home-based education program covers several important aspects, including understanding dyspnea, diaphragmatic breathing training, the use of a handheld fan, and a self-management program designed to support patients in managing their condition. This education has a clear goal: to improve patients' understanding of the mechanisms of dyspnea and its impact on their breathing and well-being. Furthermore, the program focuses on reducing patients' perceived threat and assisting in managing anxiety, which can exacerbate dyspnea. A key component of this education is breathing

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exercises using diaphragmatic techniques, which aim to increase lung capacity and reduce respiratory muscle tension. The use of a handheld fan stimulates trigeminal receptors in the face, which are connected to the respiratory center in the brain. This stimulation provides a sense of comfort and can reduce the perception of shortness of breath, thereby helping patients feel more relaxed and gain better control over their breathing (Choratas et al., 2020).

Acupuncture, as a complementary therapy, focuses on stimulating acupuncture points associated with the respiratory system, such as LI4, CV21, CV22, and ST36. Stimulation of these points stimulates the release of endorphins, enkephalins, and serotonin, which serve to provide analgesic effects and promote feelings of well-being. Furthermore, acupuncture inhibits the transmission of signals that cause the perception of shortness of breath in the central nervous system by reducing the activity of neurons in the respiratory center located in the medulla. This, in turn, can reduce the anxiety that often accompanies shortness of breath and provide a calming effect on patients. Thus, acupuncture contributes to increasing physical and mental relaxation, supporting patients in better managing respiratory symptoms (Bauml et al., 2016; Minchom et al., 2016).

Overall, these non-pharmacological interventions work through a combination of physiological effects such as increased ventilatory capacity, respiratory muscle strengthening, and improved ventilation-perfusion, as well as psychological effects such as decreased anxiety and relaxation. All of these contribute to reducing the perception of shortness of breath in cancer patients. Dyspnea in cancer patients can be caused by various interacting factors, including psychological factors (Choratas et al., 2020). Therefore, interventions that can improve the emotional state of cancer patients experiencing dyspnea are crucial to provide a sense of comfort and emotional relaxation. Breathing exercises and relaxation techniques such as meditation and yoga have also been shown to help cancer patients manage physical and psychological symptoms (McDonnell, Owens, & Umari, 2023).

The importance of mindfulness-based interventions was emphasized in managing physical and psychological symptoms for individuals with clinical health problems, including dyspnea in cancer

patients (McDonnell et al., 2023). This approach is considered promising in addressing physical symptoms related to cancer and the side effects of its treatment. This approach adopts Callista Roy's adaptive nursing theory, which focuses on psychological aspects by providing motivation, then fostering awareness and acceptance of the patient's condition. Although there is no direct correlation, patients experiencing excessive stress are more likely to experience symptoms such as dyspnea. Mindfulness therapy can be an alternative in reducing depression, stress, and shortness of breath, which are often experienced by cancer patients (Arsy, Ansori, Winarsih, & Hindriyastuti, 2025).

Non-pharmacological interventions that combine physical and psychological approaches play a crucial role in managing dyspnea in cancer patients. Physical approaches can improve ventilatory capacity and lung function, while psychological approaches, such as mindfulness, help reduce anxiety and enhance emotional control. This combination provides more holistic benefits, with physical approaches improving physical condition and psychological interventions supporting the patient's emotional well-being. Therefore, a combination of physical and psychological interventions is highly recommended to optimize dyspnea management and improve the quality of life in cancer patients.

## CONCLUSION

Various non-pharmacological interventions such as structured physical exercise, structured breathing exercises, respiratory muscle training, home-based education programs, and acupuncture have been shown to be effective in reducing dyspnea in cancer patients, particularly those with advanced lung cancer. Most of these interventions produce positive results through mechanisms involving improved ventilation, respiratory muscle strengthening, anxiety reduction, and modulation of the perception of breathlessness. The effectiveness of these interventions supports the implementation of non-pharmacological approaches as an integral part of dyspnea management in cancer patients, adaptable to the patient's clinical condition and preferences.

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## SUGGESTIONS

Effective non-pharmacological interventions for managing dyspnea include structured physical exercise, breathing exercises, respiratory muscle training, home-based education programs, and acupuncture. These approaches can be applied in both palliative and clinical settings, with nurses playing a key role in assessing dyspnea, providing education, and facilitating interventions suited to each patient's condition. Techniques such as breathing exercises, inspiratory muscle training, and handheld fan use can be taught to patients and families to promote self-management, while nurses may also coordinate complementary therapies like acupuncture or community-based Tai Chi, which help reduce dyspnea and improve quality of life.

This review recommends integrating these evidence-based interventions into nursing practice for cancer patients with dyspnea, both in hospitals and at home. Such strategies not only alleviate symptoms but also enhance comfort and independence. Further research is needed to confirm their long-term effectiveness and sustainability.

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